

ELICITING PALEOGRAPHERS' NEEDS AND MODELING A COLLABORATIVE
WORKSPACE FOR DIGITAL LIBRARY MALAY MANUSCRIPTS

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ABSTRACT

The purpose of this research is to instrument the support for Malay manuscript community (paleographers) in teaching, learning and doing research on manuscript in an electronic environment utilizing an available digital library of Malay manuscripts. The main objectives of this study are to: (i) investigate the current process of teaching, learning and researching manuscripts in Malay manuscript community that mainly involve lecturers, students and researchers (or known as paleographers); (ii) investigate what are the issues and challenges related to teaching, learning and researching in manuscript studies community; (iii) propose a new environment as a solution that can support and improve the process of teaching, learning and researching in manuscript studies; (iv) evaluate the usability of the suggested solution and gain insight from the paleographers on its effectiveness. Soft System Methodology (SSM) was employed throughout the study using a case study approach conducted at the Academy of Malay Studies (APM), University of Malaya (UM). The data was obtained from several interview sessions, focus group discussions and observations. The findings highlighted a number of issues in the process of teaching, learning and researching manuscripts mainly on the transliteration work, difficulties to find the original manuscripts for the study and locating an expert paleographer for consultation purpose. As a result, a conceptual model of an electronic platform (named as E-Workspace) for learning and collaborative research activities for Malay manuscripts was proposed to improve the current practise. The E-Workspace was modelled to focus on facilitating the manuscript community in teaching, learning and researching Malay manuscripts, particularly in transliteration work. The usability of the E-Workspace in providing a teaching, learning and research platform that are conducive for the manuscript studies are reflected by the positive feedback on the user evaluation. The E-

Workspace in general enhances the utilization of *MyManuskrip* as a resource that supports teaching, learning and researching manuscripts by providing a collaborative platform to conduct transliteration works electronically.

ABSTRAK

Tujuan kajian ini adalah membantu komuniti manuskrip Melayu (paleographers) dalam pengajaran, pembelajaran dan penyelidikan ke atas manuskrip dalam persekitaran elektronik, dengan menggunakan perpustakaan digital manuskrip Melayu. Objektif kajian ini bertujuan untuk: (i) mengkaji proses pengajaran, pembelajaran dan penyelidikan manuskrip Melayu dalam masyarakat yang sebahagian besarnya melibatkan pensyarah, pelajar dan penyelidik (atau dikenali sebagai paleografer), (ii) mengkaji apakah isu-isu dan cabaran yang berkaitan pengajaran, pembelajaran dan penyelidikan dalam komuniti kajian manuskrip; (iii) mencadangkan persekitaran baru sebagai penyelesaian yang boleh menyokong dan meningkatkan proses pengajaran, pembelajaran dan penyelidikan dalam kajian manuskrip; (iv) menilai kebolehgunaan penyelesaian yang disyorkan dan mengambil pandangan dari paleographer pada keberkesanannya. Metodologi Sistem Insaniah (SSM) telah digunakan sepanjang kajian ini menggunakan pendekatan kajian kes yang dijalankan di Akademi Pengajian Melayu (APM), Universiti Malaya (UM). Data yang diperolehi adalah daripada beberapa sesi temuduga, perbincangan kumpulan fokus dan pemerhatian. Hasil kajian mendapati beberapa isu dalam proses pengajaran, pembelajaran dan penyelidikan manuskrip terutamanya pada (i), pengajaran, pembelajaran dan penyelidikan yang diamalkan; (ii) sumber sokongan untuk kajian manuskrip dan (iii) penggunaan dan penerimaan teknologi. Hasilnya, model konsep platform elektronik (dinamakan sebagai E-Workspace) untuk pembelajaran dan aktiviti penyelidikan secara kolaboratif bagi manuskrip Melayu telah dicadangkan untuk memperbaiki proses pengajaran, pembelajaran dan penyelidikan semasa. E-Workspace telah dimodelkan fokus untuk memudahkan komuniti manuskrip Melayu dalam pengajaran, pembelajaran dan penyelidikan manuskrip Melayu, terutamanya dalam kerja-kerja transliterasi.

Kebolehgunaan E-Workspace dalam menyediakan platform pengajaran, pembelajaran dan penyelidikan yang kondusif bagi kajian manuskrip dicerminkan oleh maklum balas yang positif daripada ujian penilaian pengguna. E-Workspace secara umum meningkatkan penggunaan *MyManuskrip* sebagai sumber yang menyokong pengajaran, pembelajaran dan penyelidikan manuskrip dengan menyediakan satu platform kolaboratif untuk menjalankan kerja-kerja transliterasi elektronik.

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Eliciting Paleographers’ Needs and Modeling a Collaborative Workspace for Digital Library Malay Manuscripts

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LIST OF ABBREVIATIONS

ADEPT	Alexandria Digital Earth Prototype University of California, Santa Barbara
APM	Academy of Malay Studies
ATMA	Institut Alam dan Tamadun Melayu,
BAMBI	Better Access to Manuscripts and Browsing of Images
DBP	Dewan Bahasa dan Pustaka/ Institute of Language and Literature
DL	Digital Library
DLE	Digital Learning Environment
EAMMS	Electronic Access to Medieval Manuscripts
EH	English Heritage
EUMME	Euro-Mediterranean Union Framework of Medieval Medicine
FSKTM	Faculty of Computer Science and Information Technology
HAS	Human Activity System
HyTime	Hypermedia/Time based Structured Language)
ICT	Information and Communication Technology
IHP	Islamic Heritage Project
IUM	International Islamic University Malaysia
IKIM	Institute of Islamic Understanding
ILSD	Information and Library Services Department
JAKIM	Department of Islamic Development Malaysia
KITLV	Royal Netherlands Academy of Arts and Sciences
LEBONED	Learning Environment Based on Non Educational Digital Libraries
LMS	Library Management System
LSBU	London South Bank University
MDC	Multimedia Development Corporation
MITH	Maryland Initiative for Technology in the Humanities
<i>MyManuskrip</i>	Digital Library of Malay Manuscripts
OCR	Optical Character Recognition
PLAO	Paste de Lecture Assistee par Ordinatcur
SAPIENS	Scottish Academic Periodicals: Implementing an Effective Networked Service project
SSM	Soft Systems Methodology
STAR	The Semantic Technologies for Archaeological Resources
UKM	Universiti Kebangsaan Malaysia/The National University of Malaysia
UM	University of Malaya
UPM	Universiti Putra Malaysia/Putra University, Malaysia
UPSI	Universiti Perguruan Sultan Idris/Sultan Idris Education University.
VCC	Volvo Cars Corporation

VRE

Virtual Research Environment

CHAPTER 1

INTRODUCTION

1.1 The Research Motivation

Digital libraries have progressed from solely archiving digital materials to supporting other functions for their users such as being a platform for learning and research. In this context, digital libraries bring together collections, services and people to foster information and knowledge creation, dissemination, and sharing. This is in-lined with Digital Library Federation (1998) that has earlier suggested a digital library should not only consists of digitized collections with basic tools for searching and browsing, but it should also provide an interactive system that can promote collaboration between people using the collection and services:

Digital libraries are organizations that provide the resources, including the specialized staff, to select, structure, offer intellectual access to, interpret, distribute, preserve the integrity of, and ensure the persistence over time of collections of digital works so that they are readily and economically available for use by a defined community or set of communities.

Over the past few years digital libraries have been increasingly adopted into the learning and teaching environment since the progress of e-learning initiatives. Sharifabadi (2006) pointed some benefits that digital libraries can offer to support education via electronic learning environment including it could improve student performance, increase quantity, quality and comprehensiveness of digital resources, and render these resources for easy

discovery and retrieval for students, parents, and educators. Lee (2001) in addition added that the use of digital library in education can ensure that the resources are available over time.

There were reports about studies which utilized digital library in educational practices such as Marshall et al. 2006; Abdullah and Zainab 2007; Yaron et al. (2008). Abdullah and Zainab (2008) and Gazan (2008) in their research works reported that digital library community not only desired a digital library where they could find resources, but were also willing to be design partners and being part of the community within which they could contribute contents and communicate with others. This is essential especially when digital libraries offer hard to get or rare materials to users who can use the resources to support teaching, learning and doing research in specialized studies such historiography, studies on cultural heritage, and philology. Access to rare collection through digital libraries makes it unnecessary for students studying philology or manuscript studies or academics teaching such courses or researchers who study manuscript to go physically to the library, sit in closely monitored rare collection rooms for hours to study the often fragile manuscripts.

Hence the advent of digital libraries development has made it possible for the manuscript studies community to work with the digitized surrogates. This initiative however should be enhanced to be able to accommodate the nature of manuscripts studies such as providing online annotation and transliteration platform to foster collaboration among members of the community who is commonly called a paleographer. While paleography refers to a study of ancient writing systems that entails reading, interpreting, translating, and analyzing prehistoric handwriting, paleographer is a person who studies paleography (Drogin,1980).

For the purpose of this research work paleography refers to lecturers, students and researchers who involve in manuscript studies.

1.2 The Research Context

There are a large number of historical collections in digital libraries as evident in a few research initiatives such as *MyManuskrip, the Digital Library of Malay Manuscripts* (Mohd Hilmi 2009; Mohd Hilmi and Zainab 2007), the *British Library Digital Catalogue of Illuminated Manuscripts, Better Access to Manuscripts and Browsing of Images (BAMBI)* (Rumpler and Calabretto 1999), *Euro-Mediterranean Union framework of Medieval Medicine (EUMME)* (Bozzi, Corradini and Tellez 2005), and the *Bovary project* (Nicholas, Paquet and Heutte 2003, 2004).

MyManuskrip is an initiative that provides a digital collection of Malay manuscripts, which harnesses collaboration of a union repository of Malay manuscripts. *MyManuskrip* currently contains four manuscript collections, comprising of Institute of Language and Literature (*Dewan Bahasa dan Pustaka*) Manuscripts, University of Malaya Manuscripts, Published Malay Manuscripts and Other Manuscript Related Resources. As a whole there are more than 129 titles of manuscripts in the archive. Malay manuscripts are handwritten documents mostly written in *Jawi*-Arabic script which are dated as early as the 15th century (Rifin & Zainab, 2007). There are several manuscripts in *MyManuskrip* collection that available together with their transliteration version such as the manuscript of “Hikayat Parang Puting”. The transliteration was obtained from a publication published by Institute of Language and Literature (Jamilah, 1980). The transliteration is important for people

studying manuscript due to the fact that most manuscripts are written in old *Jawi* script which is difficult to read and understand. Although *MyManuskrip* is a good digital library initiative in archiving and make the rare collection of Malay manuscript accessible online it lacks of important services that could serve the needs of manuscript community (paleographers) in teaching, learning and doing research in manuscript studies. Therefore this research work aims to provide possible solutions to support paleographers' needs mainly in the context of teaching, learning and doing research that related to manuscript studies.

1.3 Statement of Problem

The issues related to digital library of manuscript as elaborated above has directed this study to this main problem statement:

There is lack of services in digital library of manuscript (MyManuskrip) that could support the needs of manuscript studies community (paleographer).

For this purpose of this study, lack refers to “ineduquate support tool that may be needed in in teaching, learning and doing research in Malay manuscript community. Thus this study is conducted mainly to elicit the needs of paleographers and to model a collaborative digital workspace for Malay manuscripts community.

1.4 Research Objectives

The main purpose of this research is to instrument the support for Malay manuscript community (paleographers) in teaching, learning and doing research on manuscript in an electronic environment utilizing an available digital library of Malay manuscripts. This study specifically aims to achieve the following objectives:

- i. To investigate the current process of teaching, learning and researching manuscripts in Malay manuscript community that mainly involve lecturers, students and researchers (or known as paleographers).
- ii. To investigate what are the issues related to teaching, learning and researching in manuscript studies community.
- iii. To propose a new environment as a solution that can support and improve the process of teaching, learning and researching in manuscript studies.
- iv. To evaluate the usability of the suggested solution and gain insight from the paleographers (lecturers, students and researchers) on its effectiveness.

1.5 Research Questions

This research work attempts to support the process of teaching, learning and researching Malay manuscripts and aims to answer the following questions:

- 1) What are the processes that paleographers (lecturers, students and researchers) endure when conducting Malay manuscript studies?
- 2) What are the issues and challenges faced by paleographers in the process of teaching, learning and researching Malay manuscripts?

- 3) How to model a digital workspace that could facilitate paleographers needs when studying Malay manuscripts?
- 4) What is the perceived usefulness of the digital workspace from the paleographers' point of view?

Figure 1.1 shows how each of the research objectives is mapped into the research questions.

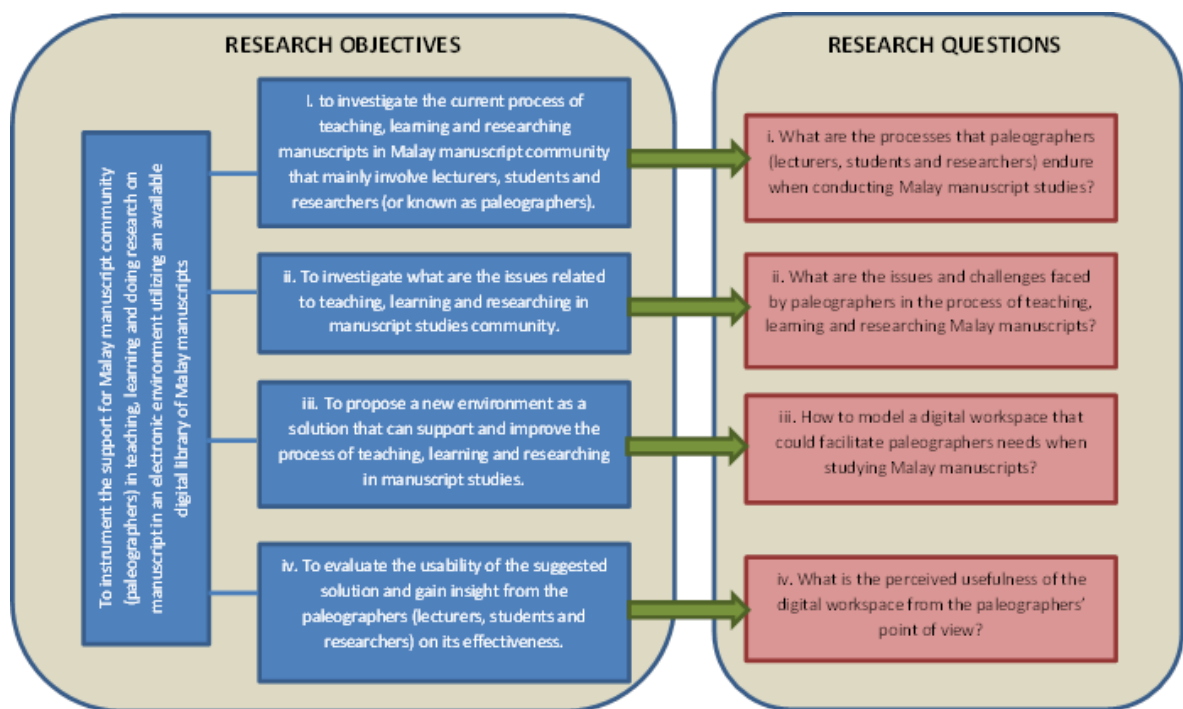


Figure 1.1: The Mapping of Research Objectives to the Research Questions

1.6 Research Framework

This research adopts a qualitative case study approach in a Soft System Methodology (SSM). The case study was conducted in Academy of Malay Studies (APM), University of

Malaya (UM) which includes lectures, students and researchers (paleographers) who are actively involved in teaching, learning and doing research in manuscripts studies. The original seven stages of SSM were adapted to fit this research work that finally consists of five phases as shown in Figure 1.1.

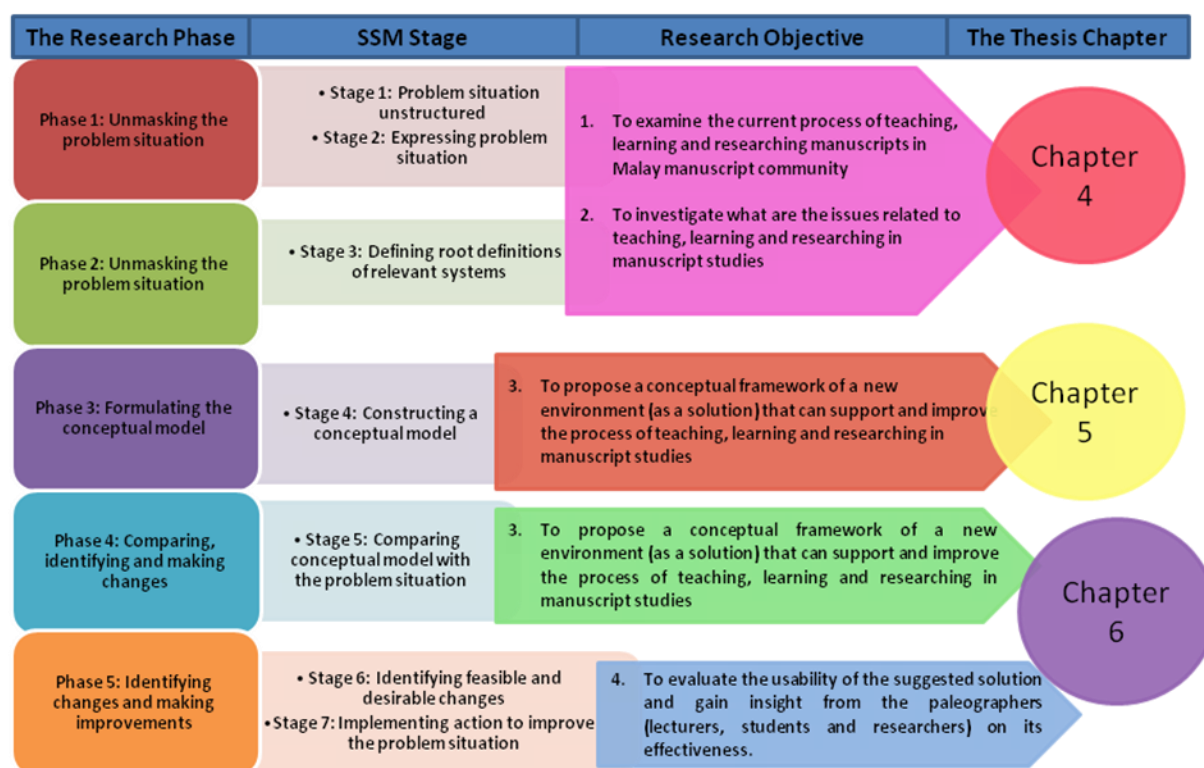


Figure 1.2: Seven Stages of SSM That Were Adapted to Fit This Research

Figure 1.2 demonstrates the research framework based on SSM:

- i. Phase 1: Study the problem situation via qualitative research methodology using interviews, focus groups and observations.

Phase 2: Defining a conceptual model through CATWOE analysis and root definition.

This stage answers the following research objectives as reported in Chapter 4:

- To examine the current process of teaching, learning and researching manuscripts in Malay manuscript community
 - To investigate what are the issues related to teaching, learning and researching in manuscript studies
- ii. Phase 3: Constructing the conceptual model and proposed a solution. This stage answers the following research objective as reported in Chapter 5:
- To propose a conceptual framework that can support teaching, learning and researching in manuscript studies.
 - To develop prototype of the proposed conceptual framework to support the process of teaching, learning and doing research in manuscript studies.
- iii. Phase 4: Compare the conceptual model and the proposed solution with the problem situation.

Phase 5: Identify changes and make improvement to the problem situation.

This stage answers the following research objective as reported in Chapter 6:

- To evaluate the usability of the suggested solution and gain insight from the paleographers (lecturers, students and researchers) on its effectiveness.

1.7 Limitations of the study

Boundaries or delimiters are necessary in a study to provide “directions for the terms used, for the scope of the study and for the potential audience” (Creswell, 1994, p.105) Several decisions are made in the preparation of this study in order to focus this study and reflect the assumptions on the research context. In order to maximize the understanding of

case study, the delimiters are made explicit. Six factors are identified to delimit this study as follows:

- i. A case study that is adopted in this research work focuses on students who are currently active in the learning process of manuscript studies. The purpose of the case study is to focus on contextual commonalities amongst participants, rather than the differences (Johnson, 1997; Yin, 2003). Hence, a small sample size is preferred. In addition, a key data source is focus group interviews. In this settings, it is difficult to infer the individuals' opinions although the conversation is rich.
- ii. The case study also involves lecturers who are currently teaching and have prior experience in teaching manuscript study particularly in the "Introduction to Philology" (JEE0020) course.
- iii. The researchers refer to postgraduates (Ph.D and Masters students) who are currently conducting research on Malay manuscript domain.
- iv. The existing literature describes digital library services that have incorporated teaching and learning tools such as auto transliteration tool. However, this study is not focused on the technical aspect of the system development process. The modules that have been developed are based on the users' requirements gathered from data collection process.
- v. The usability testing for the proposed solution is based on the current collection of Malay manuscripts in the Digital Library of Malay manuscripts system.

- vi. The term ‘paleography’ is used throughout this research to represent the studies of Malay manuscripts, while paleographers are refers to lecturers, students and researchers who are doing the teaching, learning and doinf research on Malay manuscripts. Paleography is also a study of the writing style, independently from the author personal writing style, which can help to date and/or to transcribe ancient manuscripts (Moalla, et.al, 2006).

1.8 Thesis Outline

This thesis is organized into seven chapters. Chapter 1 presents the background of the study, the context in which the research problem is studied, the objectives and research questions as well as methodology used when conducting the study.

Chapter 2 presents a review of the literature related to the context of study. This chapter examines various literature on manuscript studies particularly focuses on Malay manuscripts. Discussion on the existing of digital libraries of manuscript all over the world is presented to compare and contrast their features and functionalities as well as to highlight the issues and challenges.

Chapter 3 describes the conceptual framework, research design and methodology used in the study. This chapter elaborates on how the whole study fits into the Soft System Methodology (SSM).

Chapter 4 focuses on the first and second phases of SSM that reports on the analysis and results from the data collection process comprising of interviews, focus groups and observations.

Chapter 5 reports the third phase of SSM which describes the conceptual model produced from the first and second phase. This chapter also describes the proposed solution of a digital workspace that can facilitate manuscript studies community for teaching, learning, doing research.

Chapter 6 discusses on the fourth and fifth phase of SSM, which exhibits the comparison between existing situations during data collection process and the proposed solution. This chapter also reports on results obtained from usability testing done by the manuscript studies community (paleographers).

Chapter 7 concludes the research work by providing summary of the results based on the research questions posed in Chapter 1. This chapter highlights the significant and contributions of the study and offers recommendations for future research work.

CHAPTER 2

LITERATURE REVIEW

2.1. Overview

This chapter discusses on the research context mainly on manuscript studies and digital libraries in four main sections. The first section give details on manuscripts studies and paleography as a research field, people who conducting manuscript studies which known as paleographers, and process of teaching, learning and researching Malay manuscripts. The second section elaborates on the various definitions of digital library, contents of the current digital library and digital library initiatives worldwide to show the development of digital libraries. The third section raises current issues and challenges faced by manuscripts studies and digital library of manuscripts, while the fourth section discusses on how to enhance digital library with additional services such as including a learning space into it. This section also highlights and compares several related studies on manuscript digital library initiatives and e-learning space for manuscripts. The final section concludes the mapping of features in the manuscript learning space obtained from the published literature and content analysis from the learning spaces available online that brings ideas on what the paleographers' needs in a manuscript collaborative workspace.

The references used in this literature review were obtained from online journals, conference proceedings, Internet, printed journals pertaining to digital libraries and manuscripts in Malaysia and throughout the globe. The main resources for this literature are found through online databases subscribed by the University of Malaya Library. The literature is also

collected from other online databases such as JSTOR Archive, Library Literature and Information Science Full Text @ Wilson Web, ScienceDirect, Emerald and SpringerLink. In addition, printed materials such as journals, books, articles and dissertations are used by searching through the web OPACS, University of Malaya. Internet also forms a major source for the literature review work.

2.2 Manuscript Studies

Philology is a research field which study ancient languages, their grammars, the history and the phonetics of the words in order to educate and understand ancient texts. The philology is mainly based on the content of the texts and concern handwriting texts as well as printed documents. The paleography is a complimentary discipline of the philology which collects handwritten texts corpus and knowledge accumulated on these documents. It can be an essential skill for philologists. The paleography studies the layout of old manuscripts and their evolutions whereas the classic philology studies the content of the texts, the languages and their evolutions. The paleography is also the study of the writing style, independently from the author personal writing style, which can help to date and/or to transcribe ancient manuscripts (Moalla, et al., 2006).

2.2.1 Malay Manuscripts

Malay manuscript is a handwritten document in *Jawi* script that had existed since the early 16th century until 20th century. The Manuscripts describe the Malay cultural heritage in a range of genres such as art, history, Islam as the first religion, medicine and nationalism (Nasimah, 2011).

Most of the Malay manuscripts were written in *Jawi* scripts. *Jawi* scripts are taken from Arabic language and Persian and it had been added five new letters that made it suitable for Malay use. In earlier times, Malay manuscripts were usually written by royal and religious people. According to the history, when British came to Malaysia the Malay manuscripts had been spread all over the world. The number of collections that had been found had developed from time to time. According to Prof Dato' Ismail Hussin, it was about 2000 of manuscripts that had been taken by Raffles, Farquhar, Maxwell, Klinkert and Voorhoeve on the 19th century. In 1990, Jones, (1974) from SOAS reported that there were about 8000 copies of Malay manuscripts. Worldwide Collections of Malay manuscripts can be found in the following locations; a) National Library of Malaysia, b) Royal Asiatic Society, c) School of Oriental and African Studies, d) British Library, e) Bodleian Library f) Institute of the Royal Netherlands Academy of Arts and Sciences (KITLV), g) Library of Congress, h) National Library of Singapore, and i) National Library of Indonesia.

The following sections are focused on Malay manuscript collection. The Malay manuscript is defined as a handwritten document in the Malay language, written in *Jawi* script, which surfaced in the beginning of the 14th century and ended in early 20th century. Manuscripts generally refer to unpublished original sources and have the characteristic of being unique (Rifin & Zainab, 2007).

When comparing Malay manuscripts with western manuscripts, the obvious feature is the scripts. Malay manuscripts are written in old *Jawi* script, whereby readers need to acquire *Jawi* reading skills in order to understand the manuscripts. Even though the language used in Western manuscripts may be different, the manuscripts are written in Roman alphabets.

Malay manuscript collections refer to historical stories of ancient people, which dictate their lives, religious acts and rituals, medicine and histories of past heroes. They are a source for younger generations to learn from their ancestors, which shows evidence on the information given in history books.

The process of understanding a manuscript is not an easy task due to several reasons. The ancient manuscripts are faded, which results in poor visibility, rendering them challenging to read. Furthermore, the language used is not easily comprehensible due to old language use. Thus, readers need to refer to other sources, consults the older generations who are proficiently in reading *Jawi* and refer to classic Malay dictionary.

2.2.2 The Current Practice of Teaching and Learning Malay Manuscripts

In general, teaching, learning and researching manuscripts are involve the transliteration process. For language pairs like Spanish/English, it presents less great challenge, as it is translated using the same alphabets but may be in different spelling. However, the context is more complicated for language pairs that employ very different alphabets systems, such as *Jawi* to Roman, and this is called transliteration. In Malaysia, manuscripts teaching and learning can be described as something that is in practice. According to Ghani et al.,(2009) *Jawi*-Malay transliteration at basis was introduced to get information from old manuscripts that contain important information in various spheres of knowledge. There are three faculties in University of Malaya offer a course on manuscript learning, namely Academy of Malay Studies, Academy of Islamic Studies and Faculty of Arts and Social Science.

The uniqueness of Malay manuscripts lies in its *Jawi* script, and therefore, readers need to learn *Jawi* in order to understand the text. From the researchers' viewpoint, most Malays know how to read *Jawi*, particularly amongst the youngster generation, while some may have forgotten the skill due to lack of practice. *"The weakness in reading and understanding from Jawi sources rise when new generation seldom use Jawi as the medium in their daily activities such as spreading and retrieving information."* (Ghani et al., 2009).

Jawi is a writing adopted from Arabic characters and numerals consists of 31 characters derived from Arabic letters, followed by additional characters (ڤ, ڠ, ڬ, ڭ, ڨ). These characters are not available in Arabic language. *Jawi* was used as the main writing system in Malay language from 13th – mid 20th century. When one can read and write *Jawi*, they can proceed with the first process of understanding a Malay manuscript, i.e. the transliteration process. *"It general, transliteration is understood as a changing character from some writing style to another writing style that is suitable in pronunciation"* (Ghani et al., 2009). *Jawi*-Malay transliteration process involves translating from *Jawi* characters into Roman Malay alphabets using Unicode mapping. The remains pronunciation the same; for instance, the word "fish" is "اڤڤن" (*Jawi*) and "ikan" (Malay). (Ghani et al., 2009).

(Oh, 2006) described transliteration as follows:

" Transliteration is generally used to phonetically translate proper names and technical terms, especially from languages using Roman alphabets into languages using non Roman alphabets, such as from English to Korean, Japanese, or Chinese."

Several initiatives have been developed to facilitate the transliteration process. One of these is the development of a tool called “e-*Jawi.net*.” “E-*Jawi.net*” is an application developed by a group of researchers from Faculty Technology and Information Science, The National University of Malaysia (*Universiti Kebangsaan Malaysia*). This online tool is available to the to assist them to *Jawi* transliteration. Users can type the words in Roman Malay in the box provided, and the system will automatically translate into *Jawi*. Users can also translate from *Jawi* to Roman with this tool. Keyboard is provided with the system. This system is accessible at <http://www.eJawi.net/v3/>. Auto transliteration tool is not something new, especially in Western countries. Since Western manuscripts are in Roman alphabets, the transliteration process is easier (Roman to Roman). Advanced transliteration tools have been developed using latest technology such as OCR (optical character recognition).

“Machine transliteration is an automatic method for converting words in one language into phonetically equivalent ones in another language. For example, the English word data is commonly transliterated into Korean as “deiteo” and Japanese as “d̄eta.” (Oh, 2006).

Teaching and learning process of Malay manuscripts will be discussed in detail in the following chapter. The subsequent process of Malay manuscript learning, i.e. analysis and its details, as well as supporting tools required will be presented.

2.2.3 Malay Manuscripts Collections

In Malaysia, several attempts have been made to digitize and make Malay manuscripts available to the public. These attempts serve as a cornerstone to create a more comprehensive digital library of Malay manuscripts that would serve the public and nation in preserving and providing full access to these invaluable sources of information. The

situation in Malaysia is similar to that in the US between 1994s and 1998, in which digital library initiatives originate from the results of research carried out by Universities and major libraries based on national and institutional funding (Digital library use, 2003).

The Centre for Malay Manuscripts at the National Library of Malaysia pioneered the effort to digitize their collection of Malay manuscripts. Users are able preview a small number of pages in the digitized manuscripts, and not the whole manuscript. The website is available at http://www.pnm.gov.my/manuskrip/melayu/03koleksi/301_warisan.htm. The manuscript collection at National Library of Malaysia contains invaluable manuscripts such as *Misa Melayu*, *Hukum Kanun* and *Hikayat Hang Tuah*.

Effort was also made by the National Library of Malaysia in collaboration with other consortium members, namely, The National University of Malaysia (*Universiti Kebangsaan Malaysia*), Department of Islamic Development Malaysia (JAKIM), Multimedia Development Corporation (MDC), University of Malaya (UM), International Islamic University Malaysia (IIUM), and Institute of Islamic Understanding (IKIM). A website (www.iidl.net) was launched to help enhance the knowledge on Islam and Muslim communities. The International Islamic Digital Library is a Web-based collection of digitized books, manuscripts, theses, journal articles and working papers. This digital library is presenting in its infant stage, and its digital manuscripts collection comprises mostly of Arabic manuscripts; However, Malay manuscripts related to Islamic knowledge are also included in this initiative.

2.3 Digital Library

In general, digital library is always referred to a virtual library with digitized collections such as e-books and e-journals. However, there are various definitions of digital library based on research and practice. There are also numerous arguments on the definitions of a digital library. For example, why a digital library is called a digital library instead of a website? What makes a digital library different compared to an ordinary website or electronic library? These definitions vary based on the community research and practice. Some definitions define digital library as a collection, institution, services, and hybrid library. In the last decade, as the usage of ICT had been evolved, digital libraries have grown to be a common field of interest for users from a broad range of disciplines and this inevitably leads to many views on what a digital library actually is. Definitions of digital libraries are presented in this section as early as in the year 1996 until present.

In the introduction to the first issue of *International Journal on Digital Libraries*, Adam, Yesha, & Al, (1996) described the main theme of digital libraries, as follows: “*Digital libraries are concerned with the creation and management of information sources, the movement of information across global networks and the effective use of this information by a wide range of users*”. They promote the view of digital library as a service for collecting and organizing content on behalf of users by using information technology. In the other hand, Borgman (1996) may have put forward the clearest view of the purpose and goals of digital libraries. He noted that digital libraries encompass two complimentary ideals; digital libraries are a set of electronic resources and associated technical capabilities for creating, searching, and using information. In this sense they are an extension and enhancement of information storage and retrieval systems that

manipulate digital data in any medium (text, images, sounds; static or dynamic images) and exist in distributed networks. The content of digital libraries includes data, metadata that describe various aspects of the data (such as representation, creator, owner, reproduction rights), and metadata that consist of links or relationships to other data or metadata, whether internal or external to the digital library. Fox (1997) also agreed with Borgman, when he defined digital libraries as a collection of digital objects, including text, video, and audio, along with methods for access and retrieval, and for selection, organization and maintenance of the collection.

The term digital library has been accepted over the years throughout the world. Harter (1997) explored the growth of digital libraries by carrying out an advanced Alta Vista search in early July 1996. The keywords “digital library” and “digital libraries” retrieved approximately 20,000 entries. Six months later, the same search retrieved 30,000 hits; a significant proportion of which were relevant to the subject. He added that a digital library contains digital representations of the objects found in it - most understanding of the digital library probably also assumes that it will be accessible via the Internet, though not necessarily to everyone. But the idea of digitization is perhaps the only characteristic of a digital library on which there is universal agreement.

Pinfield (1998) describes digital library as a hybrid library which is on the continuum between the conventional and digital library where electronic and paper-based information sources are used alongside each other.

Waters (1998) stated that focus is often given on either the organizational, content, or system aspects, when describing digital libraries. Agreed with Waters, Downs & Friedman (1999) defined digital libraries as a repository which contains representations of original works that provide opportunities for students and scholars to conduct research from personal computers and workstations located in their homes, offices and laboratories. It is evident that the main characteristic of a digital library is that it must be available online, and can be accessed anywhere at any time. This definition also reflects that a digital library contains digitized copies of original works, and it is a platform for users to perform their work and research materials related to the contents of the digital library.

Marchionini and Fox (1999) define digital library as a work occurs in the context of a complex design space shaped by four dimensions: community, technology, services and content. Based on the definition, a digital library has the following characteristics:

- a) Community reflects social, political, legal and culture issues
- b) Technology serves as the engine moving the digital library field, including technical progress in computing, networking, information storage and retrieval, multimedia, interface design and so on.
- c) Services that should digital references services, real-time questions answering, on demand help, information literacy and user involvement mechanisms.
- d) Content represents all possible kinds of form and genre of information, printed as well as digital.

Fox (1999) then provided a definition of digital libraries according to the 5S framework. He defines digital libraries as complex information (data/information/knowledge) systems

that help: satisfy the information needs of users (societies), provide information services (scenarios), organize information in usable ways (structures), manage the location of information (spaces), and communicate information with users and their agents (streams). Chowdhury & Chowdhury (1999) then provides the definition of digital library as an assemblage of digital computing, storage and communications machinery together with the content and software needed to reproduce, emulate and extend the services provided by conventional libraries based on paper and other material means of collecting, cataloguing, finding and disseminating information.

Borgman (2000) discussed two substantially different meanings of digital libraries:

- a) Digital library as an organization
- b) Digital library as a service

The viewpoint “digital libraries as an organization” is often promoted by practitioners in the field, based on the assumption that traditional library institutions are the organizations in charge of information management and that the main concern is to enable these organizations to store, manage, and make available digital content in a networked world. She then defined digital libraries using three key characteristics that distinguish them from other systems:

- a) **Functionality:** Digital libraries offer integrated services to a comprehensive digital collection of cultural or scientific information that is available primarily for reading and secondarily for expanding upon, as well as annotating.
- b) **Purpose:** Digital libraries are mainly used for learning and research.

- c) Lifetime: Digital libraries provide access to information whose value is preserved across long periods of time.

There is another term that describes a digital library that is also known as hybrid-libraries. Hybrid-libraries have many common features. First, they have licensed digital collections such as CD-ROMS, DVD, or locally loaded databases obtained from external sources. Second, they provide remote access to in-house or external digital collections, the latter being mainly via the Internet. Third, they have internally developed digital resources, which may include in-house reports, statistics, local historical archives, or material digitized by scanning hard copies. Fourth, they may provide on their Web site, a subject oriented summation of the Internet sites most relevant to their clients. Fifth, all do provide training programs for their staff and users about the nature of digital resources and how to use them (Kibridge & de Palo, 2001).

This explanation is also supported by the Digital Library Federation (2002), which defined digital library as:

“...organization that provide the resources including the specialized staff, to select, structure, offer intellectual access to, interpret, distribute, preserve the integrity of, and ensure the persistence over time of collections of digital works so that they are readily available for use by a defined community or set of communities...”

On the other hand, digital libraries are different from traditional library automation in that they are designed to support the creation, maintenance, management, access to, and preservation of digital content (Hurley, 2002). Difference from Hylife (2002), he looks at

digital library as a hybrid library which is defined as a library where digital and printed information resources co-exist and are brought together in an integrated information service accessible locally as well as remotely.

Digital libraries began with a virtual library that contains digitized data for people to obtain information instead of going to the real library. However, the growing number of digital libraries today proves that digital libraries should have resources for people to access and they should incorporate services.

This definition clearly shows that a digital library should integrate software and tools that can support user activities. Choi (2006) defined digital libraries as an extension of traditional libraries to increase access to information via a digital environment with similar functions and services to those of traditional libraries.

The traditional library mentioned in the above statement refers to the physical library which users need to go in order to obtain resources. These definitions indicate that digital libraries provide services similar to the traditional library; however, the services only can be accessed online. Choi, (2006) added that Effective digital collections must include additional services to support the many activities that occur throughout the information-seeking process such as helping users provide contextual knowledge about the subject area, reduce uncertainty when using a new collection, and facilitate the identification of relevant resources.

From the definitions above it is evident that digital library is a system that is available online, provides users with digitized resources and data, supports online services that assist users to manage and use resources easily. However, the definitions may be different, depending on the research field. For example, a digital library for manuscripts may provide different services compared to a digital library for medical students. This is proven by Harter, (1997), who said, *“I do assert that the traditional library encompasses many values and properties that are considered important for scholarly communication. I am calling for a clear understanding and consideration of these characteristics as we design and develop the digital libraries of the future. “*

However, differences in definition may occur even within the same research fields. For instance, a digital library for Malay manuscripts may offer different services compared to a digital library for Greek manuscripts. Although both libraries provide digital manuscripts accessible to users a digital library for Malay manuscripts should provide transliteration tool from *Jawi* to Roman. In contrast, a digital library for Greek manuscripts may use auto-transliteration tool that can automatically transliterate a picture format to editable text. The services are different because Malay manuscripts are written in old *Jawi* script whereas Greek manuscripts are written in Roman. This emphasizes that digital libraries can be applied in many fields; however the services offered are depending on the suitability and users' requirements.

2.3.2 Contents of Digital Library

Thaller (2009) argued that a digital library should be more than a digitized collection. Digital libraries should be built according to principles that are not necessarily the same as those employed for paper collections, and it should be evaluated according to different measures. In this context, it is apparent that some of these initiatives are merely manuscript digitization projects which are then published as a web site without the essential features of a digital library.

According to Gorman, (2007), the policies and procedures of all these institutions are similar to the policies and procedures of libraries in that they play a part in:

- a) working with elements of the human record and of our common cultural heritage;
- b) furthering the use of the human record by fostering culture and learning and the creation of new contributions to the human record; and
- c) are dedicated to the preservation of all aspects of cultural heritage and the onward transmission of the human record.

Although learned societies and research are not primarily concerned with collecting documents and objects that contain or convey knowledge or aesthetic pleasure, they are concerned with studying aspects of the arts and sciences. In many cases, they are concerned with creating new knowledge that becomes part of the human record and their common cultural heritage when documented. The Britain's Ancient Monuments Society, the Bulgarian Philologist's Society in Bulgaria, the Japanese Institute of Landscape Architecture in Tokyo, and the Italian Institute of Human Paleontology in Rome all publish learned journals, maintain libraries, and facilitate the study of the particular branch of

learning with which they are concerned. Because of these activities and preoccupations, they are natural allies in seeking a unified approach to cultural heritage, similar to the many research institutes such as the British Textile Technology Group, the Institute for Thracian Studies in Bulgaria, and the Danish National Institute of Social Research in Copenhagen.

On the other hand, Schawrzwalder (1997), said that there are three criteria that a system must have in order to function as digital library, firstly, a system have a critical mass information, secondly, it must be integrated with information and service and thirdly, a system manifest the same information ergonomics that can be seen every day at a library information desk.

In addition to provide online documents and database services a strategy is needed to deliver information services to your customers. For example, Schawrzwalder, (1997) added, digital library can be thought of as consisting of “pull” technologies, wherein the user enters the system and take some action to extract information, and “push” technologies, wherein the information is automatically sent to the user. “Forms” allow user to choose options on a pull-down menu or to input requests by copying text into a window or by filling in blanks. Flexible in design and easy to implement, forms can make digital library an interactive medium. Forms can be used to accept online search and document requests, as well as to solicit customer feedback and purchase suggestions. There are a few design features that need to be observed. First, include text windows in document request forms to allow users to clip citations from emailed online search requests. Second, in designing pull-down menus, use the placement of options to suggest default values on such things as delivery date. Third, test forms extensively before releasing them to the general public. So, in the twenty-first century library a suite of electronic journals is available; a

variety of Web-based reference files, catalogues and databases; form-based services; and several technologies that push information to the customer. Integration of documents and retrieval systems allow the user to find and display information to their desktop and documents are multimedia and interactive.

Lin & Abels, (2010) defined a digital library as a Web-based collaborator space where students can learn and conduct research with real data and real digital libraries. The goal is to foster active and collaborative learning. As an example, in their research, they describe efforts in building a digital library based on the Internet Public Library and introduces various class activities the lab currently supports. (Lin & Abels, 2010).

From the discussion above, it can be summarized that in order to construct a digital library, a medium that will support active, collaborative, and exploratory learning are needed, while consider the following four essential principles:

1. The system needs to be a learning environment and an operational digital library. As in the “library school library”, students can be contributors to, and users of, the digital library. They can learn and experience firsthand how a digital library operates and how the digital library supports the need of users. Their learning experience will be enriched when their work contributes to an operational digital library. The notion of being a creator and user of the lab fits well with the social networking tools used today.
2. The system should provide easy-to-use tools and data for various digital library activities. Students need to be able to complete their assignments and hands-on practice with the latest digital library technologies and software. They need to be able to apply theories they learn to practice, and connect the assignments and projects to be practical

needs of a real library and its users. Answering reference questions submitted by real users, for example, would be a valuable experience for students in reference classes.

3. The system needs to provide a platform and where students can experiment and test new ideas and new technologies. In the digital environment, it is much easier than it is in the physical environment to set up small or collaborative projects to allow students to participate in various research activities such as prototype developing, interface redesign, metadata evaluation and the development of knowledge organizing tools.
4. The system needs to provide a demonstration space to showcase how learning and collaboration take place in a digital space. Students need to be able to work collaboratively to develop and test new ideas through the lab. The collaboration may span across time- further developing the work of previous students, for example, and across space, to allow teams from different schools and different classes to work on the same research problems. (Lin & Abels, 2010).

Even though there are a lot of thoughts and opinions on what should contains in a digital library, it can be concluded that a digital library needs a collaborative space where discussions and collaborative works can be done together in a particular place, where supporting tools are provided and digital information are available as the main resources.

2.3.3 Historical and Philological Digital Library: Initiatives Worldwide

The idea and initiative of making the libraries available virtually was begun by H.G Wells. *“The idea of a "computerized library" that would supplement, add functionality, and even replace traditional libraries was invented first by H.G. Wells and other authors, who*

caught the imagination of millions with speculative writings about "world brains" and similar fanciful devices." Harter, (1997). His invention became a popular research, especially amongst librarians with increasing growth of ICT and Internet usage. As mentioned previously, digital libraries may have differences according to the research fields. In this section, particular attention is given to digital libraries with historical and philological collections which include manuscripts.

Traditional libraries have numerous differences compared to digital libraries. The contents of digital libraries have received much attention and many ideas have been proposed. Harter, (1997) identified four criteria of traditional libraries which render different digital libraries. In traditional libraries, the collections are fixed, the objects are permanent, they offer a variety of services with limited access to materials and services.

"The objects in a traditional research library have certain properties as well. First, they are fixed, they do not normally change, or if they do, various editions are identified and considered to be different from one another. Objects are also permanent, they do not normally disappear from a collection. Finally, a variety of services to users are offered by librarians who work in the traditional library. These include assistance with searching for information resources, reference and research services, readers advisory services, and others. A traditional research library typically offers only limited access to materials and services; access to certain services may be restricted to certain classes of potential users." (Harter, 1997).

This section presents initiatives of historical and philological digital libraries. These projects are undertaken throughout the globe, with emphasis collection of historical data

and manuscripts. The development of digital libraries of ancient manuscripts is still considered scarce mainly due to the lack of expertise and limited budget to embark on manuscript digitization process.

The first initiative is known as the COLLATE Project. The European-funded COLLATE project (IST-1999-20882) is set out to design and implement collaboration for professional communities in the Arts and Humanities working with digitized historic-cultural materials (Brocks, et.al. 2001). Historical film documentation serves as an example domain for the setup of a technical environment for shared access to a digital repository comprising digitized multi-format documents on several thousand European films in the early 20th century. A detailed description of the project can be found in and on the project's website (<http://www.collate.de>). A cultural Digital Library has to offer support for task-guided collaboration, such that it should provide an environment for structured scientific discourses by defining and maintaining a model of its users' tasks and goals, as well as of the potential interrelations between these discourses and the objects in its domain.

The main contributions of COLLATE include:

- a) a Web-based collaboratory that provides a comfortable working environment and user interfaces for supporting end-users in their annotation, indexing and retrieval of multi-format, multimedia historic archive materials; and
- b) a comprehensive digital multimedia collection on European historic films and film documentation, annotated and interpreted by a multi-national team of experts using the COLLATE system.

The second initiative, known as the Bovary project, contains a collection of digitized manuscripts of Gustav Flaubert's manuscripts on Madam Bovary. This project initially began with a collection of manuscripts without transcription. The project progressed to include a text editor in order to assist users to undertake transcription tasks effectively and to produce a structured textual representation adapted to the users' requirements. The text editor essentially provides an editing environment that integrates document analysis with interactive tools, as well as making the original manuscript collection available amongst researchers and specialists of Flaubert's works to foster collaboration (Nicolas, Paquet, & Heutte, 2003)(Stephane, Paquet, & Heutte, 2004). Despite the reports of these projects, the digital libraries cannot be accessed online.

The third initiative is called Wellcome Arabic Manuscripts. This digital library consists of around 500 Arabic manuscripts dating from the 14th to the 20th century, sourced from the Wellcome Library's holdings. The core of this collection relates to the great heritage of classical medicine, preserved, enlarged and commentated on throughout the Islamic world, stretching from Southern Spain to South and South-East Asia.

Part of the Wellcome's collection of Arabic manuscripts constitutes most of the Arabic medical manuscript collection of Dr. Sami Ibrahim Haddād (1890-1957) a well-known Lebanese physician and historian of medicine ("Haddad manuscript collection"). The collection includes works by well-known Islamic authors, such as al-Majusi, Ibn Sina and Jewish authors who wrote in Arabic (al-Isra'ili). It is available at <http://library.wellcome.ac.uk/arabicproject.html>.

The fourth initiative on the other hand is called e-learning System for Greek Paleography, which is an initiative to preserve antique documents and valuable manuscripts that focuses on Greek Paleography of the Byzantine era's collection of manuscripts. This system provides an interactive e-learning platform in order to value collections in educational practice. The electronic platform is part of the D-Scribe Project that provides features for recording process, manipulation, recognition and management of valuable Greek manuscripts and rare documents. This effort begins with the digitization of manuscripts and extends to provide an E-learning platform to support the process of teaching and learning. Greek manuscripts (Drigas et al., 2005a). *"It is an E-learning system, which aims to introduce the users in paleography, specifically in Greek pearl script type paleography of the 19th to the 12th century. This content is a meeting point of the past and the future, providing historic content, taking advantage of the new technologies with an original and interactive educational way. It is founded on the manuscript taken from "The Book of Jove"."* (Drigas et al., 2005a).

This system is a platform for people to learn Greek Paleography according to the users' level. For beginners, the learning process may begin with Greek letters, giving users the opportunity to understand which letters are used in specific words cases. Following this, users may proceed to the second level where they will use examples of paleographical words, that contain letters and combinations of letters, which ascend the difficulty level. Finally, in the third level, users will use examples of paleographical words that contain letters, combinations of letters and the first type of abbreviations. In the end, users are expected to be able to distinguish the letters, the combinations of letters and the cases that are used, and the user is simultaneously trained on abbreviations.

The fifth initiative is the Islamic Heritage Project (IHP), 2006; Harvard University has cataloged, conserved, and digitized hundreds of Islamic manuscripts, maps, and published texts from Harvard's renowned library and museum collections. These rare and unique materials are presenting freely available to Internet users worldwide. IHP is made possible with the generous support of Prince Alwaleed Bin Talal which can be accessible at <http://ocp.hul.harvard.edu/ihp/>. IHP, is a collaborative initiative between Harvard's Prince Alwaleed bin Talal Islamic Studies Programme and the Harvard University Library Open Collection Programme. IHP supports teaching and learning by creating open access to vital research materials.

The sixth initiative is known *MyManuskrip*. In 2007, the Digital Library Research Group from the Faculty of Computer Science and Information Technology, University of Malaya, developed a digital library system, *MyManuskrip* or *Digital Library of Malay Manuscripts*. This project was initiated to provide a collaborative digital library environment for Malay manuscript libraries to upload digitized manuscript collections into a unified repository and share resources (Zainab, et al., 2009). *MyManuskrip* that is available at <http://MyManuskrip.fsktm.um.edu.my/Greenstone/images/html/MyManuskrip.htm>, supports browsing, searching and online reading of the manuscripts deposited in the digital library. This digital library currently holds 179 titles from two manuscript collections; i.e. the University of Malaya Library and the Malay Documentation Centre, Institute of Language and Literature (*Dewan Bahasa dan Pustaka - DBP*), Malaysia. This repository, however, can be enhanced by incorporating other features that can support teaching, learning and research using the available digitized manuscripts.

The seventh initiative is called Digital Catalogue of Illuminated manuscripts. In the UK, British Library's *Digital Catalogue of Illuminated Manuscripts* (accessible from <http://www.bl.uk/catalogues/illuminatedmanuscripts/welcome.htm>) contains a number of different manuscript collections, including a rich collection of medieval and renaissance manuscripts. The digital library provides access to images and information on its manuscripts to students, scholars, and the general public for reference. The digital library provides a simple search function that enables searching by keywords and dates as well as advanced search using different combinations of search options. Other services offered are static such as a thematic tour of various aspects of the British Library's Illuminated Manuscript holdings, with information on each manuscript, browsing and searching an illustrated glossary of terms and access to information regarding the scope and history of each collection.

The eighth project is Adfontes, which is a website dedicated to E-learning application developed and maintained by the History Department of the University of Zurich. The website is in German, and aims to help students develop the skills necessary for archival work. The site consists of online tutorials for transcribing and dating Latin and German documents, using digitally reproduced samples of documents from the archives of the Abbey of Einsiedeln in Switzerland. This project is available at <http://www.adfontes.unizh.ch/1000.php>.

The digital libraries mentioned above mainly provide digital materials for users from their archives. There are many digital libraries available today, whereby several are merely a

collection of digitized data used solely for browsing and searching. However, others are equipped with teaching and learning tools, individual resource management and collaborative workstations. This leads to the issues and problems on what a digital library should be. It is necessary, to incorporate other services in digital libraries in order to support the teaching and learning process of manuscript studies by allowing individuals or group of collaborators to use the digital library for teaching and learning services.

Harter (2007) stated that, *“If we know what "digital" means, what is meant by the library half of the term? In what ways are digital libraries indeed libraries in some meaningful sense? How are they not? More to the point what values, properties, and characteristics of the traditional library do we want to retain as we build the digital libraries of the future?”*.

It is clear that developing a digital library should include the contents of digital library. It is desirable to remember the main objectives on developing a library, as well as the criteria of a traditional library to be incorporated into a digital library. He then added that new digital libraries will clearly have much added functionality capabilities that have never been present in traditional libraries. At the same time, however, we are in danger of losing important properties of the traditional library. In our efforts to build new systems we rarely ask what aspects of traditional libraries are important to retain.

2.4 Digital Libraries of Manuscripts: the Issues and Problems

The common digitizing process is scanning an analogue source such as printed documents, audio recordings or video tapes into computers. There are numerous reasons for digitization, which include editing purposes, especially in design. Libraries carry out digitization for knowledge sharing, whereas historians digitize to protect cultural heritage

items from deterioration due to age. “*..they should realize that the precious information and resources under their care could forever disappear due to various reasons if effective preventive measures are not taken seriously.*” (Manaf, 2008). Regardless of the reasons, digitization is perceived as a good initiative. This section discusses the issues faced by current digital libraries, with focus on digital libraries for cultural heritage and historical collections.

Rusbridge, (1998) writes that human interaction in the digital library is discussed far less frequently. One would almost get the impression that the service tradition of the physical library will be unnecessary and redundant in the digital library environment. He suggests that digital library proponents must consider the role of people (as users and service providers) if the digital library is to be truly beneficial. Technology and information resources, on their own, cannot make up an effective digital library. Digital library needs discussion service mainly in the context of the digital reference librarian, physically separate from the reader, but service also manifests itself in simple issues like information about the range of systems available, documentation on their use, support and help in the face of problems, assistance and training of users in their use.

Beside role of people who provide services (such as librarian) in the digital library, Meyyappan et al, (2001) said service like specific task-based is needed in the use of digital materials. This is agreed by Mayer & Rauber, 2009. When handling digital materials, people not only access them for browsing, but it needs to be considered to provide tools and technique to support users’ activities such as analysis. For example, in a scholarly setting, tools to help with interpretive processes, note taking and collaboration have been

noted as important aspects of use (Palmer, 2002). Digital materials are dependent on the systems and tools developed for their presentation and usage, and also can become separated from their mechanisms of presentation and usage and so some provision must be made to identify how the digital materials were intended to be used.

However optimistic we may be, the use of digital library resources is by no means sublimely obvious to many of their potential users, and it is certain that many problems cannot be resolved through appropriate graphical interfaces alone. Much of the issue here is the role of the library relative to its community, often undertaken by the subject librarian, in engaging with the needs of its community, and getting closer to understanding the customer. There is an enormous range of available information in the world. The role of the library is to select, acquire, organize and make available an appropriate subset of these resources. This focusing in from the universe of resources is significant in many contexts, including for learners. Partly this is an issue of quality control. The library has a role here in the digital world in encouraging access paths to quality. Certainly, services must be offered by libraries which provide access to material outside their primary purchases. But the goal of the library is to match the institution's needs and budget against the available information and its costs.

Digital library requires a good collaboration and cooperation by all relevant parties. For example, in developing a digital library for historical collections, collaboration from institutions that have historical collections needs carried out first. According to Manaf, (2008), the impact of providing such services could only be enhanced through a combined effort that synergizes the effort of individual cultural institutions.

One of the major problems in a DL environment is to maintain or to ensure the originality of information. With the easy availability of technology, one can easily use information created by others and can claim it as one's own (Chowdhury and Chowdhury, 1999). This brings to the copyright issue that makes some people more comfortable in keeping original historical collections and they take ownership as an honor. They feel that the collections are too valuable to be shared with others and as an option, the owner make the resources available to access by charging them. Charging for content is critical to the financial viability of many digital libraries as well as other providers of online content. There are many difficulties in addition to the financial power to purchase and subscribe to library licenses when searching for all kinds of philologically interesting materials in the digital age. Difficulties arise when persons or institutions claim a monopoly for themselves and do not grant permission for certain materials to be made digitally available (Szurawitzki, 2009). This attitude brings difficulties to researchers, especially to those with financial constraints. The owners of historical collections, which include libraries, sometimes make profit using historical collections.

Issues in digital library of manuscripts have been arising since many years. In Malay manuscripts particularly, Kratz (1981) stated that the attitudes of Malay people are also an issue in developing digital libraries. *"In Malay philology, by contrast, we are confronted with a living tradition. Not only is Malay a living language the understanding of a text reserved in a 17th-century copy poses no great intellectual problem to a speaker of modern Malay, but there is also the fact that the copying of Malay manuscripts is considered not so much a mechanical process of reproduction as a*

creative process. And what has been regarded by many editors as evidence of the Malay copyist's laziness, carelessness, and ignorance might just as well be viewed as a manifestation of a writer's freedom in using the text''.

Kratz, (1981) claimed that there are several things which require change before digitization. It seems that there is still some way to go before Malay philology can begin to build on the foundation of computerized data. However, a major step towards the building up of this multi-purpose data bank would have to be the preparation of editions with a view to their potential usefulness and suitability for computer recording, i.e., editions which pay as much attention to the text of one manuscript as they do to the text of a whole tradition of manuscripts.

Another persistent issue on developing digital libraries for historical collections is technology acceptance. Some people may find it difficult to accept new technologies nowadays, especially amongst earlier generation. It is also known that these people are the owners of the historical collection. This issues has been raised since 1981 by Kratz, (1981). He said that the use of computers is not yet popular in the humanities and certainly has not penetrated to the field of Malay philology. Over the 240 years, the use of computers has received a strong impetus, and it is no longer possible for an editor, especially one dealing with "open" traditions, who wants to be taken seriously to ignore its existence or deny its potential. Researchers who are accustomed to hard copy references may find that digitization is nothing of concern. Even though in this new technology era, some people are still comfortable handling things lively. This is especially when dealing with manuscripts, whereby they believe that they have to see and feel it directly in order to learn and understand the collection. The computer screen is deemed

insufficient. *“With respect to ILL (a digital library) and access to other collections, the major issue remaining unchanged by electronic technology is that of delivery. History scholars and emerging scholars, for better or worse, will continue to rely on ILL departments to get the materials they need.”* (Delgadillo & Lynch, 1999). Since the hard copies of manuscripts are still available they feel that there is no reason why they should refer to digitized collections.

They added that, although it is true that advances in history via electronic technology have given the student historian potential advantages undreamed of before, the historians’ methods of work will change slowly, as other investigations have shown. This is explained by the need of future historians to rely on the methods of quality control taught by an established historian who in the past did not have to rely on sophisticated systems of information. As one participant observed in their research; *“Why spent time getting lost in the vast literature of history via a computer when I know I can trust a citation noted by a historian whose work I have examined.”* (Delgadillo & Lynch, 1999).

In the education sector, such as universities, faculties play a vital role in generation human capital. Faculties are responsible in designing the teaching and learning syllabus and give impact to students on what they should concern on and what they should not. History graduate students are guided by their faculty advisors and their professors, not only within the content of the courses they take but also within the context of how they do their work. What the faculty member does is what the student does. The faculty’s attitudes toward the library, collections, specialists, and generalists on the library staff become the student’s

attitudes (Delgadillo & Lynch, 1999). If a faculty projects digitization as a good activity, the students will perceive digitization as a positive activity and vice versa.

Initiative is one of the most important aspects in developing digital libraries. Digitization is the first process which needs to be carried out. Once the process is completed, focus can be given on strategies for promoting and collaborating among people and other relevant institutions. *“Digitization of classical texts is the bottleneck that delays the development of digital philology and, consequently, of computational philology”*(Boschetti, 2009)

Research on digital libraries need to be conducted in order to protect cultural heritage. As a new field, for example, the digital library of history, and any kind of history writing that involves an archived website, is still in its infancy, but if it is to become an integrated part of media history as well as of Internet history in general, we must discuss how the archived digital library can be used as a historical document, and what a digital library archive should look like if it is to be as useful as possible for media scholars (Brugger, 2008). The process does not merely involve digitization, and leaving the rest to the public. The contents of a digital library should be the methods for making full use of it and the contributions of digital libraries to the future generation need to be pondered seriously. He added that the primary problem is that the actual act of finding, collecting and preserving changes the digital library that was on the live web in a number of ways, thus creating a unique version of it and not simply a copy.

From the discussion above, problems and issues faced by digital libraries are identified; lack of services in digital libraries, awareness of the digitization, collaboration amongst the

philologists and historical librarians, ownership and copyright, financial constraints, the people's attitude towards sharing historical collections, technological acceptance, as well as the services which should be offered in digital libraries. However, these issues can be solved by developing an effective digital library that will prove to users how digital libraries can simplify tasks. The contents of a digital library are of utmost importance to achieve this purpose. The following section discusses further on this.

2.5 Enhancing the Digital Library with Services

Sharifabadi, (2006) examined the role of university libraries and librarians in the digital age and concluded that as technology continues to transform the classroom and campus environment, librarians must be trained to deal with new problems and questions. The main purpose of digital libraries is to facilitate, organize and provide knowledge and resources to their users. Knowledge sharing and information is required amongst library staff, researchers, faculties, students and other departments within the university or institution. This encourages them to work together, develop their skills, and form strong and trusting relationships. For example, collaboration between the faculty (who acts as the course designer) and the library (who acts as the resource manager and service provider) can support teaching and learning objectives. The collaboration can be more effective by incorporating students' contributions and feedback. Everyone should demonstrate their roles actively by joining and participating in the organization, as well as contributing their ideas in order to build a genuine partnership. Hence, library can be seen as a vital role in the learning community, which acts as a guide to enable people to become information literates. Peacock (2005) noted that:

“Librarians, as educators, must demonstrate the hypothesis that the design and delivery of information literacy-rich curriculum rooted in rigorous pedagogical principles and blended with the astute use of ICT will result in profound learning. In order to lead a shift in practice, we must prove that such an approach is not only viable but also vital.”

According to Borgman (2011), a digital library should have a high-profile leader, who is a key person who can work to obtain the support of the institution’s management and promote a climate of change. Library should not only manage the resources and provide services, but it needs to be a medium that collaborate all parties together while providing ongoing support needs of the parties involved.

To perform such an integration of digital libraries into learning space, some problems have to be considered. One major problem is the nonexistence of appropriate interface components to access heterogeneous digital libraries. In particular, most existing digital libraries offer a web interface for search and retrieval of documents only. This is suitable for a human user, but it makes automatic access to the digital library from a learning space difficult. Another important problem is that adequate descriptions by domain specific metadata are needed to store and manage learning objects (document or document component associated with metadata) in the content repository of the learning space. Since most digital libraries are originally not designed to be part of a learning space, they are only able to provide bibliographic metadata for the contained documents. But in this context, e-learning specific metadata like learning topics or difficulty level is needed and therefore has to be added before an imported document can be used.

At last, file formats and structures of the documents contained in digital libraries have been chosen appropriate to publication aspects rather than learning aspects. As a result, most documents delivered from digital libraries are monolithic with poor physical structuring, for example, they consist only of a single file (e. g. in PDF format) even if they feature a complex logical structure (e. g. chapters, sections, images, etc.). For learning purposes, it would be more appropriate to directly access separate subparts of a document as single learning objects. This would also support the reuse of existing document components in new contexts, which enables the efficient creation of new and specific learning materials. For this reason, it is suitable to fragment such monolithic documents physically into several smaller components. This is, in fact, a hard technical problem that is ignored by most common learning space. (Oldenettel et al., 2005)

2.5.1 Digital Libraries as a Learning Space

A distance education or an e-learning system, which is chiefly contributed by the Internet, has been developed over the years. The idea is to gather educational programmers and materials on Web servers to support online courses. Digital libraries potentially change the conventional teaching and learning process in classrooms into the virtual environment, supported by suitable theories and methods depending on the specific courses. Digital library must not be seen as merely a digitized collection of information objects and related management tools, but as an environment bringing together collections, services, and people to support the full cycle of creation, dissemination, use and preservation of data, information and knowledge. (Raitt, 2000).

Digital libraries can be considered as a medium that provide library services and collections to collaborate together in order to develop a digital learning community. There are several aspects and functions involved in a digital library which includes supplementary materials of courseware materials, lecture notes, lesson plans, intelligent tutoring systems, annotating tools, students' activities and students' portfolios. Educational values can be added in a digital library by developing a suite of services for teaching, learning and also researching. (Champeney, 2004) said that this can be done by applying digital learning environment (DLE) into digital library. The DLE offers services for creating, searching, and displaying learning materials such as lectures and laboratory exercises from knowledge databases and personal digital library collections in classroom, laboratory, and self-guided environments.

In addition, digital libraries should provide services for authors and instructors such as annotation, evaluation and peer review of donated materials. Faculties, in turn, act as the owners of courses and are therefore capable to access certain data sets. Faculty's administrators who control interactions amongst students, and provide the latest archive and news. It can be concluded that faculties, students, lecturers and other public users are able to collaborate and share knowledge via digital learning environment. Interdisciplinary activities, lifelong learning, and the process of education will all benefit through digital libraries. Digital libraries will promote change and innovation in education.

Evaluators of educational information technology curricula note that the process of designing and implementing digital learning environment into a digital library is complex, and requires both technological and pedagogical expertise. Technical components such as hardware infrastructure and software development) must be combined with instructional

knowledge (including familiarity with subject content and pedagogical expertise) in order to produce digital learning environments that achieve the twin standards of success: learning improvement for student users, and cost effectiveness, in terms of time and effort for instructors and funds expended for administrators (Champeney, 2004).

Two digital library projects have been identified that incorporate learning space. The first example is The Alexandria Digital Earth Prototype (ADEPT). The objective of this project is to add functions and services for undergraduate teaching to a digital library of geospatial resources. The DLE services are being developed and evaluated iteratively over the course of this research project. In the 2002-2003 academic years, the DLE was implemented during the fall and spring terms in undergraduate geography courses at the University of California, Santa Barbara (UCSB). The second example is called Learning Environment Based on Non Educational Digital Libraries (LEBONED). LEBONED enable the integration of digital libraries into learning management system and solve the current problems. The main goal is the development of a methodology to integrate digital libraries into learning management system. Additionally, the development is involved an infrastructure and some essential tools in order to support system's tasks.

According to Wolf et al., (2007), he founds that the needs of digital learning environment are still depend on disciplines. He and his team have examine the broad categories of disciplines (life science, physical science, computer science and engineering, mathematics, social science, and humanities), and they found an obvious differences in the perceived value of digital resources and their use of specific types of materials. The participants were asked about their perception of digital resources for instructing students. Approximately

70% of life scientists found the resource to be of great value while less than 40% of mathematicians responded with that answer. Despite this large difference, there is much less variation at the other extreme. Less than 1% of life scientists to less than 4% of mathematicians held the opinion that digital resources have no value for instructing students.

2.5.2 Manuscripts Learning Space: the Initiative Worldwide

A list of selected digital libraries of manuscripts, the contents and services that had been provided has been presented in section 2.3.3 is a small number of digital libraries that offer learning space. Since this study is devoted on digital libraries with learning space, there are eleven learning spaces selected for discussions. A few learning spaces have been discussed in Section 2.2.4, however, a comprehensive list is given in this section to facilitate the analysis process.

a) Better Access to Manuscripts and Browsing of Images (BAMBI)

Calabretto and Bozzi (1998), reported that BAMBI is a European digital archive of medieval manuscript collections, which was developed to provide a virtual platform for historians and philologists to browse and navigate the manuscripts in the collection (Rumpler & Calabretto, 1999). In addition, BAMBI provides a tool for philologists to write annotations, navigate between words of the transcription and match pieces of images in the numerated picture of the manuscript (Bozzi and Calabretto 1997; Calabretto and Bozzi 1998). This system uses the standardized hypermedia language HyTime (Hypermedia/Time based Structured Language). This project was initiated by European project LIB-3114 for

Digital Libraries and were developed in two phases. The first phase was completed in 1998 and the second phase was developed a year later. *“In the initial BAMBI project, we developed a workstation for historians, and more particularly philologists, which allow them to make transcriptions, annotation, indexing, etc. on manuscripts. In this paper, we present the design of the virtual library based on BAMBI, allowing philologists to work on ancient manuscripts within the Internet network”*. (Rumpler & Calabretto, 1999). This project is devoted on developing tools that assists users on carrying out research on manuscripts. Techniques such as auto-change format from image (manuscript) to editable text (transliteration version that the user works on) are provided. However, this system can no longer be accessed. Thus, a question arises whether this project was successfully implemented since the links provided can never be reached.

b) E-learning of Greek Paleography

E-learning System for Greek Paleography is an initiative to preserve antique documents and valuable manuscripts that focuses on Greek Paleography of the Byzantine era's collection of manuscripts. This system provides an interactive E-learning platform in order to value collections in educational practice. The electronic platform is part of the D-Scribe Project that provides features for recording process, manipulation, recognition and management of valuable Greek manuscripts and rare documents. This effort begins with the digitization of manuscripts and extends to provide an E-learning platform to support the process of teaching and learning Greek manuscripts (Drigas et al., 2005).

c) Euro-Mediterranean Union Framework of Medieval Medicine (EUMME)

The Euro-Mediterranean Union framework of Medieval Medicine (EUMME) project is quite similar to BAMBI, and is focused on developing tools to facilitate users to read manuscript collections. EUMME aims to highlight and facilitate international collaboration amongst medico-pharmaceutical culture enthusiasts to overcome geographical borders, ideological and religious barriers among the community. EUMME is perceived as an effort to make the manuscripts available in different historical and philological environments, which enables users to access homogeneous digital archives in a collaborative environment (Bozzi et al., 2005). According to Bozzi et al. (2005), the aims of this project can be summarized into three large sectors, as follows:

1. To increase the knowledge of the data relative to the subject treated (philological-textual sector);
2. To increase linguistic knowledge (linguistic-lexicographic sector);
3. To develop technological tools specific for the study and dissemination of the information produced (technological tool sectors).

This project focuses on different historical and philological environments. *“The EUMME project appears to challenge the solution to the problem of transmitting any information (text and/or related images) to external users (either specialist or generic), so to be available in different historical and philological environments. In effect, the use of standards for the metadata description, the exchange and the management of information allow users to access a huge amount of homogenous digital archives in a collaborative way.”* (Bozzi et.al, 2005).

d) Emily: A Tool for Visual Poetry Analysis

The users of this tool are researchers and analysts of Maryland Initiative for Technology in the Humanities (MITH) group at University of Maryland, College Park. The analysts study a selection of verse-letters and poetry from the 19th century written by the poetess Emily Dickinson. The objective is to determine whether there are indicators of eroticism in these documents. For this purpose, the analysis need to work with an XML-encoded version of the poetry maintained by the Dickinson Electronic Archives. This version of the collection contains a transcription of the poetry itself, along with other relevant tagged information such as the provenance of the poem and the condition of the original manuscript. The original manuscripts are included in the collection, in the form of scanned images. To perform such analyses, the scholars require a tool that allows them to:

1. Perform various forms of searches on multiple poems at the same time.
2. Visualize the search results, in various ways, in real time.

The services offered are accessing the original manuscripts, searching (single word search and multiple search terms) and search visualization (Madnani, 2005).

e) Scottish Academic Periodicals: Implementing an Effective Networked Service project (SAPIENS)

This project was funded by the Scottish Higher Education Funding Council (SHEFC) in order to provide an electronic publishing service to periodicals of this nature so that they may establish themselves in the digital information environment. The project needs to be aware of the following factors:

- changes in the way that the publishing industry delivers information;

- developments in methods of teaching and learning; and
- concerns over the presence of Scottish culture in the digital environment (Wallis, 2004).

f) EAMMS

The interest in the use of computers in cataloguing of medieval manuscripts led to the creation of the Electronic Access to Medieval Manuscripts (EAMMS) project. EAMMS is collaboration between the Hill Museum & Manuscript Library and the Vatican Film Library at Saint Louis University, whereby the purpose is to develop guidelines for encoding and storing pre-modern manuscript descriptions in electronic form (Pass, EAMMS website). The project focuses on the use of MARC and SGML encoding of information in manuscripts. The EAMMS began their MARC Initiative to review existing MARC encoding procedures and adapt them as much as possible to existing specialized techniques for cataloguing pre-modern manuscripts. The MARC Initiative was also charged with creating a supplementary standard for AACR2 that increases specific rules and suggestions for the creation of item-level records for literary and archival manuscripts that were created through “a scribal mode of book production as opposed to those produced by printing movable type.”(Pass, EAMMS MARC Initiative website). The work of the EAMMS MARC Initiative eventually led to the publication of Descriptive Cataloging of Ancient, Medieval, Renaissance, and Early Modern Manuscripts (AMREMM) in 2003. AMREMM is intended to be a MARC-compatible supplement to AACR2 that will allow the creation of item-level MARC catalog records for pre-modern manuscripts. AMREMM provides guidance for choosing chief sources of information for pre-modern manuscripts,

and gives examples for the description of these manuscripts in greater detail than in AACR2. (Harvey, 2007).

g) Paste de Lecture Assistee par Ordinateur (PLAO)

Paste de Lecture Assistee par Ordinateur means the computer aided reading environment. It is an integrated system devoted to the visualization and editing of hypermedia documents from literary materials including document images and structured text. The capabilities offered are transcription of manuscript images, editing for linking document with corresponding structured textual representations. The system is expected to provide professional users with innovative tools to work on documents from the library's collections.

Users are able to search for different copies of a manuscript, as well as access translations and comments. However, this system is solely used for consultation. Users cannot enrich the database with comments (Lecolinet et al., 1998)

h) KLEIO system

The pioneering software system KLEIO was developed by Dr Manfred Thaller of the Max-Planck-Institut at Goettingen. The system revolutionized historical computing in the German-speaking regions. This system begins with the principle of "source-oriented data processing" and provides historians with a range of sophisticated, discipline-specific tools to preserve the integrity of source materials while handling materials in various ways. KLEIO offers powerful text handling facilities, routines for dealing with varieties of historical dating systems and interlocking currency systems, hierarchical and non-

hierarchical relationships, record-matching algorithms, fuzzy and context-sensitive data handling, mapping, image retrieval and information exchange routines. The approach has been accurately defined as a “historical workstation”.

The English version of KLEIO has been released, allowing a wider community of historians to access the software. This version consists of a substantial revision of the software, and a completely new tutorial was written for English historical practice data sets. The tutorial was tested on classes of students in 1993, is equally suitable for individual works. KLEIO Version 5.1.1 is suitable for personal computers of 386 specifications or above. The release includes StanFEP, which represents the Standard Format Exchange Programme developed by the KLEIO team. An advanced version of KLEIO integrates the features of this version with KLEIOs’ Image Analysis System (KLEIO IAS), which is presently available only for UNIX platforms. The English Version of KLEIO was made possible by the support of The British Academy: The Royal Historical Society: The Max-Planck-Institut fuer Geschichte, Goettingen: The Committee for Advanced Studies, University of Southampton: The Arts Faculty, Queen Mary and Westfield College, University of London.

i) The Semantic Technologies for Archaeological Resources (STAR)

To develop new methods for linking digital archive databases, vocabularies and associated unpublished online documents are often referred to as “Grey Literature”. This project aims to support the efforts of English Heritage (EH) by integrating data from various archaeological projects and their associated activities.

j) COLLATE

COLLATE involves development of a distributed Web-based repository with dedicated knowledge management facilities to support users with digitized cultural materials. The European-funded COLLATE project (IST-1999-20882) is aimed to design and implement a collaboratory for professional communities in the Arts and Humanities working with digitized historical-cultural materials. The main contributions of COLLATE include:

- A Web-based collaboratory that provides a comfortable working environment and user interfaces for supporting end-users in annotation, indexing and retrieval of multi-format, multimedia historical archive materials; and
 - A comprehensive digital multimedia collection on European historical films and film documentation, annotated and interpreted by a multi-national team of experts using the COLLATE system (Keiper et al., 2001).

This section discusses on what the services that digital libraries should have. The digital libraries here refer to historical collections of data. Collections of digital libraries should focus on images, as well as other data such as audio, video and text. Hence, digital libraries will contain a rich and variety of data. This is agreed by Uhlíř (2008), Consequently, digitization is not simply making images; it is and must be much more. Therefore images must be accompanied by other types of documents, i.e. by full texts, audio/music documents, multimodal/multimedia documents etc. Digitization of historical documents and/or holdings leads to the paradigm shift this way and it is one way to the information and knowledge society.

One of the purposes for digitizing library collections is collaboration. Collaboration is important amongst researchers in various fields to foster knowledge sharing globally. Digital libraries should offer a conducive environment to support teaching, learning and collaborative research activities. Thus, it is very good to utilize the ICT in digital library initiatives. Making collections available online as well as services greatly facilitates collaboration process. *“The question facing service developers, then, is not what services need to be offered digitally, but rather how do we proceed in the long term to move all services to an e-research platform.”* (Palmer, et al., 2009)

The content exchange enables organizations to aggregate their content globally in effective and efficient ways. With ICT, information that was traditionally kept in paper format can be digitised and stored in the system and made publicly available. The idea of providing and presenting information via electronic means and formats truly fascinates managers of information agencies worldwide. Presently, cultural institutions are actively connecting their collections to these emerging knowledge networks. They are creating innovative network services based on digital surrogates of their current collections in a rich, interactive digital environment (Manaf, 2008).

However, this initiative requires comprehensive tests. Digitization requires a large amount of budget, which will incur higher costs with digital library activities and services. Archives are spending an increasing amount of time, money, and effort in developing on-line finding aids. Many archives are embracing the digital age even further by providing digital surrogates of items in their collections. However, the majority of archives are doing so without having analyzed users' information-seeking behavior (Anderson, 2004). If the

research is not performed properly, a digital library project will end up as a waste when it is not being used by people and do not contribute anything in research. Anderson added that, *“Historians and archivists do, however, share some important principles. Both need to understand the context of creation, to know who created a record and why, and its custodial history. But how should this basic building block of research be accessed and presented, to what level of detail, and what additional information and tools are required to build enhanced research resources?”* This research can be carried out through survey or system testing that can provide results on the users’ searching behavior as well as the activities that can attract users to use the system. (Crane et al., 1999) stated that the digital library must provides at least three types of access namely, “Access to Digital Representations of the Human Record”, “Access to Labelled Information about the Human Record” and “Access to Automatically Generated Knowledge.

Furthermore, the services and activities in digital libraries should be adaptable to various research fields. In this manner, the system will be applicable in a vast range of areas. “The literature presented here represents a wealth of research that as a whole builds a broad understanding of the scholarly information activities that this infrastructure needs to support across disciplines. More and more scholars will be performing these activities online, and it follows that research library services will need to be an integral part of that digital work environment. In fact, academic and research libraries should expect that soon; in all but the most specialized cases, good service will be defined by scholars’ ability to find and use the digital information they need for all stages of research (Palmer et al., 2009).

In conclusion, digital libraries should contain collections of digitized data, and integrates services to assist users in collaborations. Thus users will not be constrained to browsing collections, but are able to perform collaborative activities with others.

2.5.3 Enhancement of Digital Library of Malay Manuscripts

From the analysis of the initiative worldwide in section 2.3.3 and 2.5.3, it can be seen that there are only a few initiatives that offer learning space. Table 2.1 shows a comparison amongst manuscripts initiative worldwide that brings the ideas of the functional requirements of the digital library of Malay manuscripts. However, there are several projects which lack of information resources namely, GRAFOS, ICARUS and OPERA.

Table 2.1: Manuscripts Initiative Worldwide

Manuscript Initiatives	Details	Digital Collection	Manuscripts Studies Tools	Limitations
<ul style="list-style-type: none"> • COLLATE (2001) (http://www.collate.de) 	<p>Objective: To design and implement a collaboratory for professional communities in the Arts and Humanities working with digitized historic-cultural materials</p> <p>User community: Professionals in Arts and Humanities</p>	<p>Available Contents: A comprehensive digital multimedia collection on European historical films and film documentation, annotated and interpreted by a multi-national team of experts using the COLLATE system</p>	<ul style="list-style-type: none"> • A Web-based collaborator that provides a comfortable working environment and user interfaces for supporting end-users in their annotation, indexing and retrieval of multi-format, multimedia historical • Archive materials • Cataloguing, • Indexing (structured, free), and allows for unstructured discourses based on free comments. • Simple search options based on filmographic information 	<ul style="list-style-type: none"> • Lack of services for teaching and researching environment
<ul style="list-style-type: none"> • Bovary (2003, 3004) (currently inaccessible via Internet) 	<p>Objective:</p> <ul style="list-style-type: none"> • The Digitization of a manuscript folder compound of almost 5,000 original manuscripts issued from “Madame Bovary” • Provides an hypertextual edition allowing an interactive and free Web access to materials <p>User community:</p> <ul style="list-style-type: none"> • Librarians • Researchers in literary sciences 	<p>Available Contents:</p> <ul style="list-style-type: none"> • Collection of digitized manuscripts of Gustav Flaubert’s manuscripts on Madam Bovary • Explicative notes on the history of these works • Critical edition of Flaubert’s work 	<ul style="list-style-type: none"> • Include a text editor that essentially provides an editing environment that integrates document analysis with interactive tools as well as making the original manuscripts collection available amongst researchers 	<ul style="list-style-type: none"> • Lack of services – just provide a text editor • No longer accessible via Internet

	<ul style="list-style-type: none"> • Researchers in computer science 			
<ul style="list-style-type: none"> • Wellcome Arabic Manuscripts (2004) (http://library.wellcome.ac.uk/arabicproject.html) 	<p>Objective:</p> <ul style="list-style-type: none"> • To design and implement an open-source cataloguing tool storing metadata as TEI P5 • To create rich descriptive metadata for each manuscript • To create a Web front-end to be hosted by the BA to deliver metadata and cover-to-cover images • To create fully-formed MARC21 records for each intellectual work to facilitate resource discovery via the Wellcome Library catalogue • To create around 75 000 full-colour images of the manuscripts for online access. <p>User community:</p> <ul style="list-style-type: none"> • Teachers and students from medical area 	<p>Available contents:</p> <ul style="list-style-type: none"> • Islamic manuscripts • Consists of around 500 Arabic manuscripts dating from the 14th – 20th century, sourced from Wellcome Library's holdings • Heritage of classical medicine, preserved, enlarged and commented on throughout the Islamic world, stretching from Southern Spain to South and South-East Asia 	<ul style="list-style-type: none"> • Search 	<ul style="list-style-type: none"> • Lack of services- only provide a simple search function
<ul style="list-style-type: none"> • E-learning system of Greek Paleography (2005) 	<p>Objective:</p> <ul style="list-style-type: none"> • To preserve antique documents and valuable manuscripts • Provides an interactive E-learning platform in order to value collections in educational practices <p>User community:</p> <ul style="list-style-type: none"> • Users in paleography, specifically in Greek pearlscript type paleography of the 12th-19th century. • Scholars interested in paleography 	<p>Available contents:</p> <ul style="list-style-type: none"> • Greek Paleography of the Byzantine era's collection • First-level courses : used examples of paleographical words, that contain letters only • Second-level courses : used examples of paleographical words, that contain letters and combinations of letters • Third-level courses : 	<ul style="list-style-type: none"> • Available via Internet and CD-ROM • User registration and sign-in (via Internet) • Recording process • Manipulation • Recognition • Management 	

		used examples of paleographical words, that contain letters, combinations of letters and the first type of abbreviations		
<ul style="list-style-type: none"> • Islamic Heritage Project (2006) (http://ocp.hul.harvard.edu/ihp/) 	<p>Objective:</p> <ul style="list-style-type: none"> • Catalogues, conserves, and digitizes hundreds of Islamic manuscripts • Supports teaching and learning by creating open access to vital research materials. <p>User community: Researchers, educators, historians and the general public</p>	<p>Available Contents:</p> <ul style="list-style-type: none"> • Islamic manuscripts, maps, and published texts from Harvard's renowned library and museum collections • Digital copies of over 280 manuscripts, 275 printed texts, and 50 maps, totaling over 156,000 pages 	<ul style="list-style-type: none"> • Search using Arabic virtual keyboard is available • Browse function 	<ul style="list-style-type: none"> • Lack of services – only provides simple search and browse function
<ul style="list-style-type: none"> • MyManuskrip (2007) (http://MyManuskrip.fsktm.um.edu.my/Greenstone/images/html/MyManuskrip.htm) 	<p>Objective:</p> <ol style="list-style-type: none"> 1. To provide a collaborative digital library environment for Malay manuscript libraries <p>User community:</p> <ol style="list-style-type: none"> 1. Researchers, educators, historians and the general public 2. Institutions as the manuscript collection contributors 	<p>Available Contents:</p> <ul style="list-style-type: none"> • Malay manuscripts • 179 titles from three manuscript collections, i.e. the University of Malaya Library, the Malay Documentation Centre and DBP, Malaysia 	<ul style="list-style-type: none"> • Browse option (DBP collection, University Malaya Library collection, the Malay Documentation Centre collection and other related manuscript collections) • Search engine (by title, publisher, creator, original place, subject, summary and additional options) • General Information menu bar (Home and About <i>MyManuskrip</i>) • Help (guidance for using <i>MyManuskrip</i> system) 	<ul style="list-style-type: none"> • Lack of services – only provides simple search and browse function
<ul style="list-style-type: none"> • Digital Catalogue of Illuminated 	<p>Objective:</p> <ul style="list-style-type: none"> • to provide access to images and 	<p>Available Contents:</p>	<ul style="list-style-type: none"> • Search function (by keywords and dates) 	<ul style="list-style-type: none"> • Lack of services – only provides search and

Manuscripts http://www.bl.uk/catalogues/illuminatedmanuscripts/welcome.htm	<p>information about medieval and renaissance manuscripts</p> <p>User community:</p> <ol style="list-style-type: none"> 1. Students 2. Scholars 3. General public 	<ul style="list-style-type: none"> • medieval and renaissance manuscripts • Descriptions and images of western manuscripts with pictorial and decorative embellishments 	<ul style="list-style-type: none"> • Advanced search using different combination of search options • Thematic tour of various aspects of the British Library's illuminated manuscript holdings • Information about each manuscript • Browsing and searching an illustrated glossary of terms and access to information about the scope and history of each collection. • Catalogue of digital images 	<p>browse function</p>
<ul style="list-style-type: none"> • Adfontes http://www.adfontes.unizh.ch/1000.php 	<p>Objective:</p> <ol style="list-style-type: none"> 1. To help students develop the skills necessary for archival work <p>User community: Student</p>	<p>Available Contents:</p> <ul style="list-style-type: none"> • Latin and German • Online tutorials for transcribing and dating Latin and German documents • Archives of the Abbey of Einsiedeln in Switzerland 	<ul style="list-style-type: none"> • Registration and sign-in • Sign-in by university/organization subscribed to this system 	<ul style="list-style-type: none"> • Accessible for university/organization subscribes to the system only.
<ul style="list-style-type: none"> • BAMBI http://www.ilc.pi.cnr.it/bambi.html 	<p>Objective:</p> <ul style="list-style-type: none"> • To design, prototype and produce advanced tools for interfacing databases of reproductions of ancient manuscripts <p>Type of manuscript that can be used in this system/tool: European</p> <p>User community:</p> <ol style="list-style-type: none"> 1. General users 2. Professional students of texts: philologists or critical editors of classical or medieval works <p>Contents:</p>	<p>Not Available</p>	<ul style="list-style-type: none"> • Search of Manuscript (selection from an ordered list, multi-criteria search, and use of keywords) • Transcription of manuscripts • Indexing of transcriptions • Annotations on manuscript transcription • Word-image concordance • Automatic column and line recognition 	<ul style="list-style-type: none"> • No longer accessible via Internet • No manuscripts digitized collection

	<ul style="list-style-type: none"> • User population surveys; • Detailed project plans; • Reports on technology for microfilm digitization; • BAMBI market reports; • Articles; • Proceedings of the seminar on "Digital Techniques for the "Study of Manuscripts" • Final reports. 		<ul style="list-style-type: none"> • Word-image concordance • Manual correction of the results of the automatic concordance • Available online and in CD-ROM 	
• EUMME	<p>Objective:</p> <ol style="list-style-type: none"> 1. To increase the knowledge of the data relative to the subject treated (philological-textual sector) 2. To increase linguistic knowledge (linguistic-lexicographic sector) 3. To develop technological tools specific for the study and dissemination of the information produced (technological tool sector). <p>Type of manuscript that can be used in this system/tool: Arabic, Hebrew</p> <p>User community: Medieval medicine scholars</p> <p>Contents:</p> <ol style="list-style-type: none"> 1. Large sample of texts relative to medieval medicine pharmacology in Latin, Greek, Occitan, Catalan, Castilian, Italian and ancient French 2. Primary sources and a selection of secondary sources: <ul style="list-style-type: none"> - Primary sources: handwritten documents which have been reviewed comprising of medicine, pharmacopoeia, botany (and possibly alchemy) - Secondary sources: bibliographic information for each primary source such as comments, studies, essays (reproduced in digital format), in the 	Not Available	<ul style="list-style-type: none"> • Look-up image archive with digital representation of the source documents on a high-resolution monitor • Transcribe, annotate and index text presented in the images, • View the transcribed version and index locorum in a window adjacent to the display of the source document • Automatically match each word of the transcription, of the index locorum and of the annotations with the portion of the source document image in which the word is found, • Allow the compilation of the lexicographical items from the textual and image archives • Export information on manuscripts in the form of xml-formatted text 	<ul style="list-style-type: none"> • Not accessible via Internet • No manuscripts digitized collection

	case of ancient materials, extremely useful from a historical and documentary point of view and references to Latin, Greek, Arabic and Hebrew sources.			
• Emily	<p>Objective:</p> <ul style="list-style-type: none"> To conceive and implement a tool suitable to the visualization of free-flowing natural language text such as poetry To empower users to analyze such text without ever leaving this visualization tool. <p>Type of manuscript that can be used in this system/tool : Poetry from the 19th century by the poetess Emily Dickinson.</p> <p>User community: Researchers and analysts of the MITH (Maryland Initiative for Technology in the Humanities) group at University of Maryland, College Park.</p> <p>Contents: Data from Dickinson Electronic Archive</p>	Not Available	<ul style="list-style-type: none"> Importing data from Dickinson Electronic Archive Represent and visualize using Emily Perform various forms of searches on multiple poems simultaneously. Visualize search results in various ways, in Real time 	<ul style="list-style-type: none"> Not accessible via Internet No manuscripts digitized collection
• SAPIENS	<p>Objective: To offer assistance to smaller Scottish publishers for online serial publications by providing server space, technical support, high-profile gateway and various value-added services,</p> <p>Type of manuscript that can be used in this system/tool : Scottish cultural periodicals</p> <p>User community:</p> <ul style="list-style-type: none"> Scottish publishers Students to access learning materials from home <p>Contents:</p> <ul style="list-style-type: none"> Scottish culture in a traditional sense Materials befitting a modern information economy. Small number of publications offered by the demonstration service related to Scottish archaeology and literature 	Not Available	<ul style="list-style-type: none"> User registration and sign-in Each HTML version of an article within the service incorporates Dublin Core metadata incorporated into it. Dublin Core metadata within each article is the foundation for the service's search facility. By title, author and/or subject Offers articles in both HTML and Adobe's portable document format (PDF). 	<ul style="list-style-type: none"> Not accessible via Internet No manuscripts digitized collection

<ul style="list-style-type: none"> • EAMMS Project (http://www.hmml.org/eamms/) 	<p>Objective:</p> <ul style="list-style-type: none"> • To identify the type of information contained in a summary catalogue record and determine how the information might be encoded for storage in a relational database • To identify and classify additional categories of information contained by a full, scholarly catalogue record, and determine how this information might also be encoded • To test and refine guidelines for encoding by creating a database of electronic catalogue records encoded according to the guidelines, and allows online access to this database. <p>Type of manuscript that can be used in this system/tool: Medieval and Renaissance manuscripts User community: Public Contents:</p>	Not Available	<ul style="list-style-type: none"> • Allows remote access • Allows linked to digitalized images and transcriptions of text • Enables quick search with less effort than printed volumes. • Allows philologists to consult, transcribe and index manuscripts 	<ul style="list-style-type: none"> • No manuscripts digitized collection
<ul style="list-style-type: none"> • PLAO Project 	<p>Objective:</p> <ul style="list-style-type: none"> • To provide professional users with innovative tools to work on documents from the library collections. <p>Type of manuscript that can be used in this system/tool: Flaubert's manuscripts User community: Public Contents: -</p>	Not Available	<ul style="list-style-type: none"> • Transcribing • Editing capabilities and text / image coupling • Document analysis • Browsing and navigation 	<ul style="list-style-type: none"> • No manuscripts digitized collection
<ul style="list-style-type: none"> • KLEIO System (software which needs to be installed into computer) 	<p>Objective:</p> <ul style="list-style-type: none"> • To preserve the integrity of source materials while handling these materials in various ways <p>Type of manuscript that can be used in this system/tool: German and English manuscripts User community: Public Contents: -</p>	Not Available	<ul style="list-style-type: none"> • Powerful text handling facilities • Routines for dealing with varieties of historical dating systems and interlocking currency systems • Hierarchical and non-hierarchical relationships • Record-matching algorithms 	<ul style="list-style-type: none"> • Not accessible via Internet • No manuscripts digitized collection

			<ul style="list-style-type: none"> Fuzzy and context-sensitive data handling Mapping, Image retrieval Information exchange routines 	
<ul style="list-style-type: none"> The Semantic Technologies for Archaeological Resources (STAR) 	<p>Objective:</p> <ul style="list-style-type: none"> To develop new methods for linking digital archive databases, vocabularies and associated unpublished online documents, often referred to as “Grey Literature” <p>Type of manuscript that can be used in this system/tool:</p> <ul style="list-style-type: none"> Raunds Roman Archaeological Database Raunds prehistoric data Raunds environmental sampling data Silchester LEAP data <p>User community: Public</p> <p>Contents: 535 documents from the corpus collection</p>	Not Available	<ul style="list-style-type: none"> Excavating grey literature documents Information extraction techniques Ontology Semantic annotations GATE application environment - GATE is an architecture that provides the framework and development environment for deploying natural language software components 	<ul style="list-style-type: none"> Not accessible via Internet No manuscripts digitized collection
<ul style="list-style-type: none"> COLLATE (http://www.collate.de) 	<p>Objective:</p> <ul style="list-style-type: none"> To assist scholars in the preparation of critical editions based on manuscripts. To design and implement collaboratory for professional communities in the arts and humanities working with digitized historical material <p>Type of manuscript that can be used in this system/tool: European manuscripts</p> <p>User community: public</p> <p>Contents:</p> <ul style="list-style-type: none"> A comprehensive digital multimedia collection on European historical films and film documentation, annotated and interpreted by a multi-national team of experts using the COLLATE system. 	Not Available	<ul style="list-style-type: none"> Web-based collaboratory that provides a comfortable working environment and user interfaces for supporting end-users in their annotation, indexing and retrieval of multi-format, multimedia historic archive materials Cataloguing, Indexing (structured, free), and allows for unstructured discourses based on free comments. Simple search options based on filmographic information 	<ul style="list-style-type: none"> No manuscripts digitized collection

• GRAFOS (OAK, Madrid)		Not Available	• Allow philologists to consult, transcribe and index manuscripts.	• No manuscripts digitized collection
• ICARUS (Historical Archive of the Comune of Genes)	(Historical Archive of the Comune of Genes) is a system for scanning and optical storing archive, with indexing of document contents.	Not Available		• No manuscripts digitized collection
• OPERA (IRISA, Rennes)		Not Available	• Allows consultation of manuscripts, transcription and indexing	• No manuscripts digitized collection

According to Zanni, (2010) there are two types of digital libraries, digital library as a repository and digital library as Virtual Research Environment (VRE). Both criteria are found suitable to explain what a digital library of Malay manuscripts is supposed to be. The descriptions of each criterion are as follows:

Digital library as a repository

This digital library is the most common library and directly systems from the original models of traditional libraries. Similar to conventional libraries, these digital libraries provide access, storage and preservation of materials. Digital libraries are often run by librarians, with great attention to metadata.

Digital library as Virtual Research Environment (VRE)

These digital libraries are mostly used by Digital Humanities. These digital projects have higher virtual working spaces than simple digital libraries, in which they provide digital environments for scholars and researchers to work with texts. Though less traditional, these digital libraries have their roots in the first ideas of Bush (1945) and Licklider (1965), namely the memex and the procog system. These projects add a strong centering in collaboration, aggregation and networking where old visions were more focused on individual knowledge or “intellect augmentation”(Engelbart, 1988).

The focal point of these projects is more on texts themselves rather than collection. Therefore, they are more concentrated on providing services and functionalities compared with simple static digital objects. Tools are offered for working with texts, which vary from linguistic analysis tools to annotations. These digital libraries are often not referred to “digital libraries”; rather, they are termed “electronic editions”. Abdullah & Zainab (2007)

and Masullo and Mack (1996) succinctly summarized the three roles digital library in K-12 education: (1) as a resource for teaching in curriculum development; (2) as a resource for learning to enrich students' experience; and (3) as an authoring space in support of students' learning. Digital libraries do not only offer innovative strategies for learning opportunities, but they can make significant impact on enhancing and improving ICT and information literacy skills amongst students and teachers. This is because the hosting of information, retrieval and handling of information from the Internet require a fair amount of computer skills and Internet literacy (Zainab et al., 2009) as well as information literacy (Abdullah et al., 2006). Besides the criteria from Zanni, (2010) through this literature review, another criteria that best described a digital library of Malay manuscripts is digital library as a collaborative workspace.

Digital library as a collaborative workspace

Collaboration in digital library is not unique anymore to many developed countries such as BAMBI and EUMME. Common characteristic of these projects is the expansion of access either through digitisation for rare or remote resources or collaboratively building the digital resources or collections to share the cultural heritage and experience of the state with other people. (Abrizah, 2007). Collective intelligence can be defined as a shared group of intelligence that emerges from people who working together for a consensus decision making (Lesser, et. al, 2012).

Collaborative workspace can be defined as a system which allows researchers to work on a project without a need to be in the same physical location (Bothma, 2006). Such a system was deemed necessary because of today's global network of researchers who are divided

by both location and time. The need therefore exists. This system is referring to the online system. An online collaborative workspace allows researchers to work together on projects by providing various means of sharing information and resources. In the other hand, Gillet, et al., (2005), believed that collaborative workspace is particularly describes the eJournal, a Web service integrated in the proposed learning environment that enables the collection and sharing of preparatory notes and experimental results with both peers and teaching assistants.

However, there are some issues related with collaborative workspace had been raised, such as the distribution of roles among students (e.g. critic, mediator, idea-generator) (Burton, 1998), equality of participation, and reaching a common understanding (Teasley and Roschelle, 1993), while task-oriented issues involve the understanding and application of key domain concepts. Jermann et al., (2001) said that the collaborative systems described here are distinguished by the nature of the information in their models, and whether they provide advice on strictly collaboration issues or both social and task-oriented issues. It is begin by taking a look at systems that focus on the social aspects of collaborative learning. Over the past decade, it has be seen an explosion of network-based technologies that enable traditional and non-traditional distance learners alike to learn collaboratively. These environments enhance traditional distance learning curricula by giving students the opportunity to interact with other students and share ideas. But especially for domains in which teamwork is critical, do these environments measure up to traditional classroom group activity? Classrooms provide supportive environments where teams of students learn in the presence of an instructor who helps to manage and guide the collaboration, providing clear goals as to what is expected from the group process.

It is believed that the development of digital libraries as repository, a VRE and also a collaborative workspace will provide benefits for digital library users. On the one hand the availability of teaching materials provided by a learning space could be enlarged by reverting to existing materials. On the other hand, contents of digital libraries could be used in new contexts.

2.6 Summary

This chapter provides a background on ongoing and completed works pertaining to this study. The chapter presents an overview and the definition of Malay manuscripts, followed by a discussion on the current teaching and learning process of Malay manuscripts and their collections. The definitions of digital libraries are also examined, followed by the contents. After considering several carefully chosen historical and philological digital library projects initiatives, this chapter is focused on analyzing the contents and services of digital libraries of manuscripts. The enhancement of digital library with services and the significance of collaboration in digital libraries are presented and it is believed that such collaboration will increase productivities of the user community. A number of manuscript learning spaces available worldwide are reviewed and analyzed in order to extract the potential features of Malay manuscript workstation.

Finally, a comparison of 21 manuscript learning spaces, their major features, components and limitations are presented. The current practices in digital library research and development, and analysis obtained from published literature serve as a basis for the conceptualization of core features for the Malay manuscript workstation in this study. Analysis of users' requirements (paleographers) will confirm the needs and relevance of the

features. Expectations of other features and services, as well as content that need to be incorporated into the digital library will also be derived from this analysis. The methodology used in this study will be elaborated in detail in the following chapter.

CHAPTER 3

RESEARCH DESIGN AND METHODOLOGY

3.1 Overview

This chapter reports on research design and methodology that were used when conducting the research work in order to meet its main objectives, which was to investigate the needs of paleographers and to model a collaborative digital workspace for Malay manuscripts community. This study employed Soft Systems Methodology (SSM) to seek answer to the research questions using qualitative case study by means of interview, focus group and observation as shown in Figure 3.1. Qualitative research is the method for people who are interested in studying human behavior and the social world inhabited by human beings. They found increasing difficulty in trying to explain human behavior in simply measurable terms. Research which attempts to increase our understanding of why things are the way they are in our social world and why people act the ways they do is “qualitative” research. Measurements tell us how often or how many people behave in a certain way but they do not adequately answer the question “why?” (Hancock, 1998). Research which attempts to increase our understanding of why things are the way they are in our social world and why people act the ways they do is qualitative research (Charoenruk, D, 2000). Hence, the best method for this study is the qualitative research.

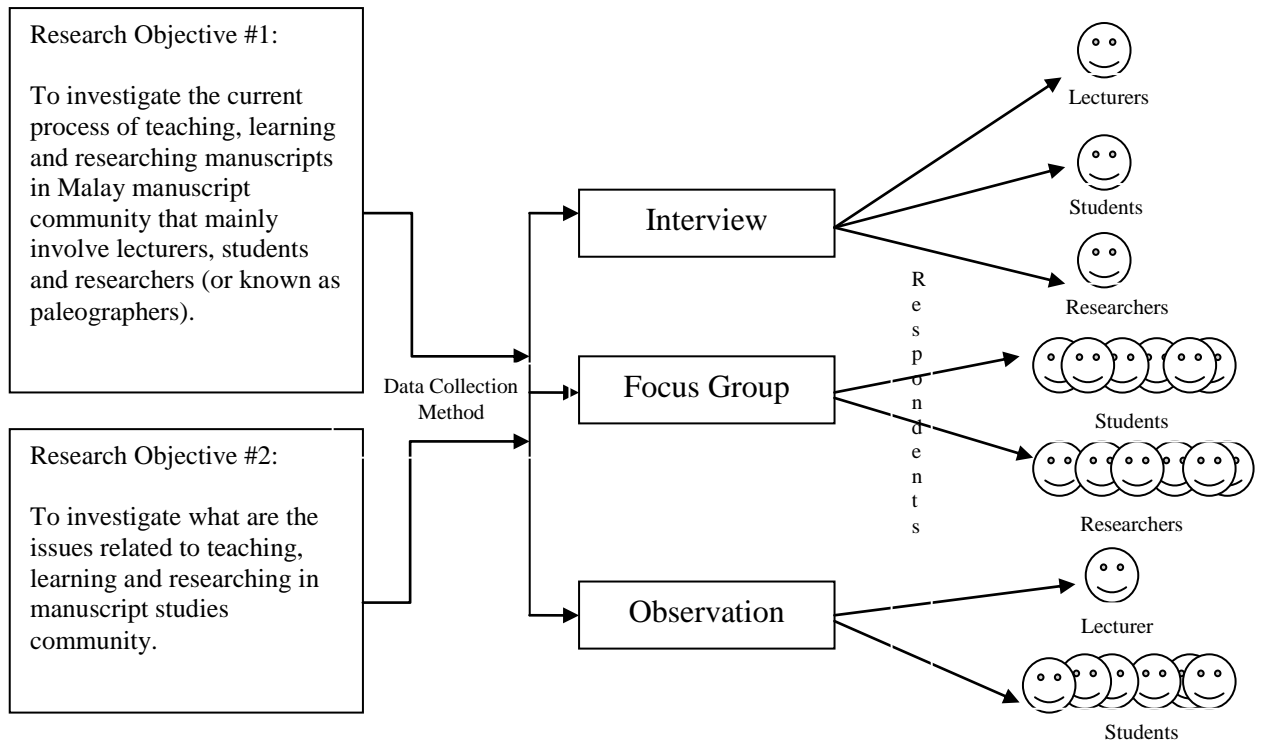


Figure 3.1: The Mapping of Research Objectives and Data Collection Methods

The rest of the chapter discusses on data collection methods and procedures including instrument development, data analysis techniques, and reliability and validity of the data through triangulation techniques.

3.2 Soft Systems Methodology (SSM)

Soft Systems Methodology deals with situations where people are active subjects and objectives are unclear (Platt and Warwick, 1995). SSM is commonly employed in unstructured situations that is concerned with Human Activity System (HAS). HAS is a collection of activities people purposefully engaged that exhibits the relationship among the activities. In SSM, it is believed that the whole is more than the sum of its parts. A continuum of problems arises from such organized, purposeful human activities. At one

end, the problem can be formulated precisely and a commensurate solution sought. Such problems are known as “hard” problems. At the other end of the continuum, the “problem” cannot be formulated and stated precisely, and the “problem” is simply an area of concern requiring attention. This type of problem is known as a “soft” problem.

In systems thinking, there are two complementary elements known as hard and soft systems. Hard systems are influenced by control and information theory, and include Systems Engineering, Systems Analysis and Operations Research. Soft systems represent a reaction to the inability of hard systems to adequately respond to real world problems (Checkland, 1981a, 1981b; Jenkins, 1969). Hard system methodologies are used to address issues that are clearly defined and the issues fit in well-defined decision-making procedures. SSM is proven to be effective where human behaviour is irrational and to address complex or “messy” problems (Checkland, 1981b).

The core of SSM is the construction of models for the systems under study. These models are used to understand and discuss how to propose organizational change. SSM is a seven-stage process, as shown in Figure 3.2

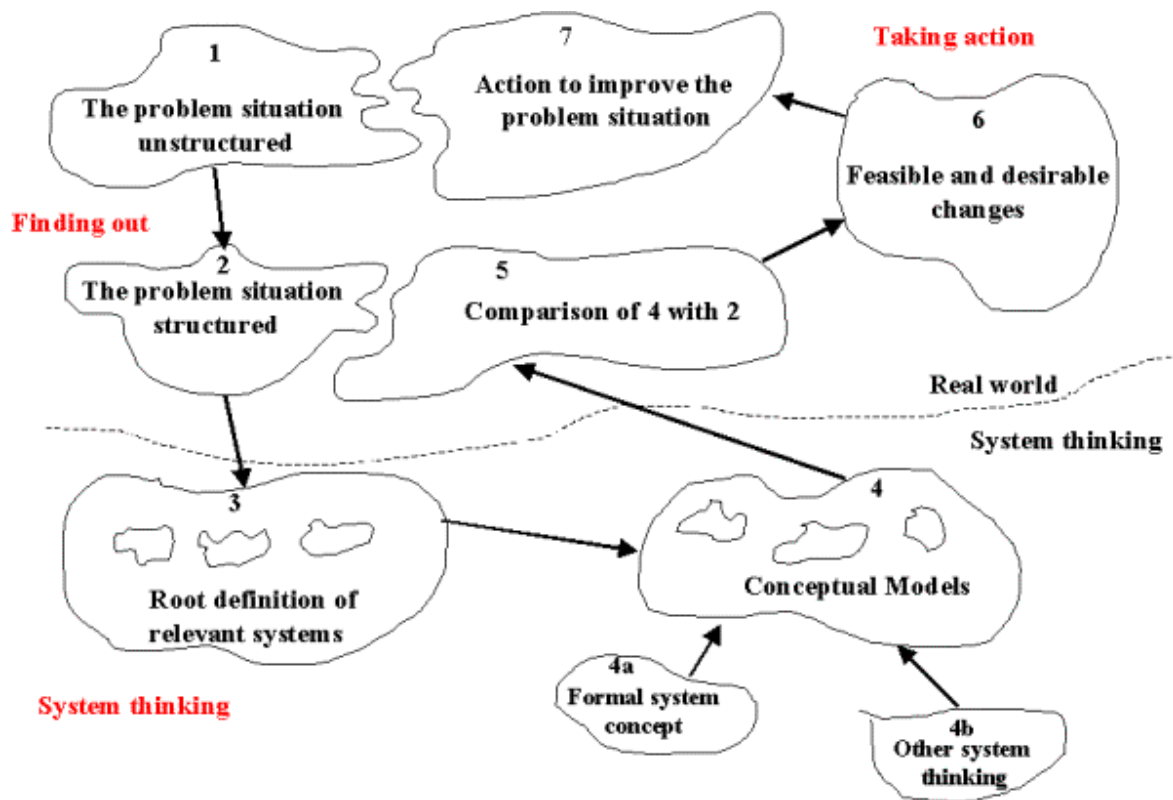


Figure 3.2: Soft Systems Methodology (SSM) according to Peter Checkland (Source: Checkland, 1981)

When it comes to applied and complex real world problems, SSM enables users to organize the problem situation having multiple conflicting objectives, purposes and values. SSM is a process which is capable of rectifying conflicting objectives in search of feasible solutions that lead to qualitatively new solutions. The soft system approach to the analysis of a real world situation is certainly relevant in the field of educational practice. SSM reveals unrecognized issues which are not practiced in the teaching and learning process. The recommendations arising from this analysis will be examined closely and where feasible, will be implemented. Thus this chapter demonstrates that the process of teaching and learning can be improved using the Soft System Methodology for analyzing real world areas of concern.

It can be deduced from the above discussion there is only one methodology which fits into the unique characteristics of how a digital library can support services in teaching, learning and research in manuscript studies, i.e. SSM. SSM is the obvious methodology due to the following reasons:

- 1) SSM is capable of achieving systems and a holistic view of the situation under consideration;
- 2) SSM is able to obtain worldviews of various participants involved in the situation;
- 3) SSM provides awareness on the conflicting perspectives and issues within the system;
- 4) SSM ensures that manuscripts are involved participants when looking for a solution, which gives them control over the situation;
- 5) SSM ensures that all participants are involved in cycle of action and learning; and
- 6) SSM develops relevant systems.

Figure 3.3 below shows the seven stages of SSM that applied to the current study.

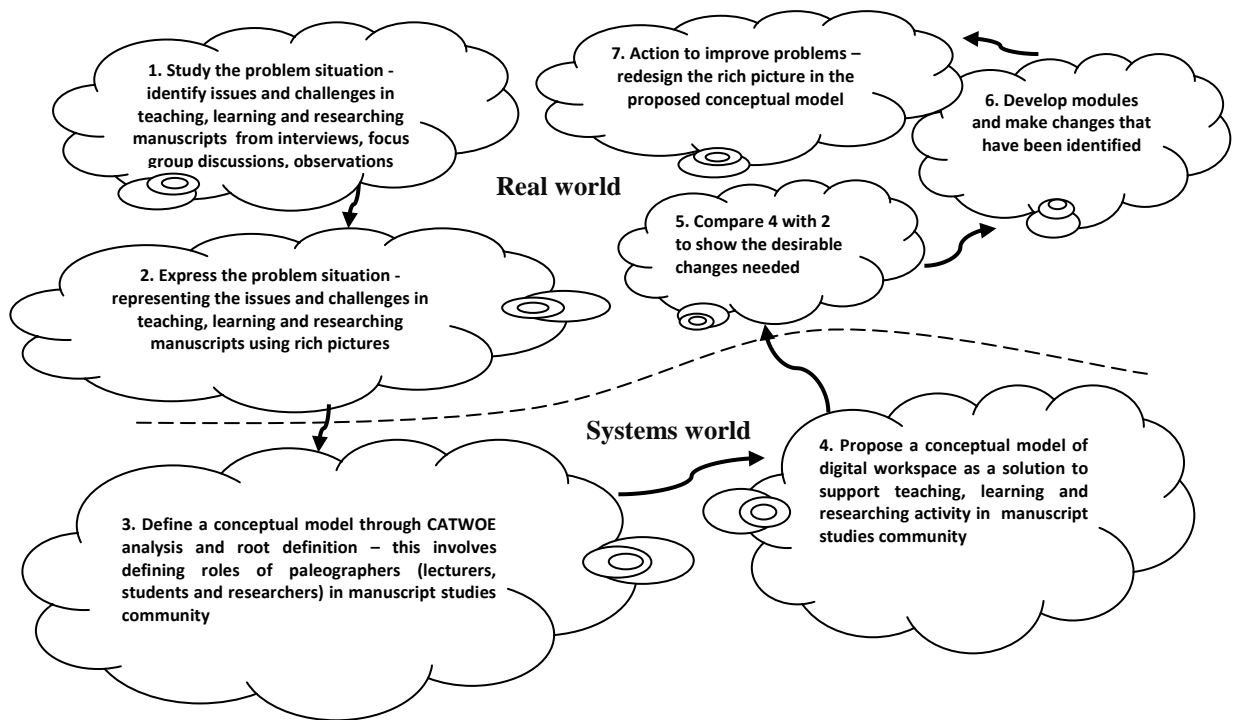


Figure 3.3:
Figure 3.3: Application of seven stages of SSM into current study

3.2.1 Overview of Seven Stages of SSM

Stage 1: Study the Problem Situation

Stage 1 involves exploring the problem situation within the real-world frame of thinking. Information such as organizational history, culture, structure, type and number of stakeholders, their perspectives and assumptions needs to be collected. The purpose of this phase is to obtain a vague idea of the problem situation even though the idea can be unstructured. This is to ensure that a range of possible relevant choices can be made. Problem situations are called rich pictures and they are vital to gain understanding on the problem situation. The Rich Picture is an SSM technique that represents the relationships between the Clients, Actors, Transformations, World-view, Owners, and Environment (CATWOE), within the scope of the system of interest (Checkland and Scholes, 1990).

Stage 2: Express the Problem Situation

The product of the second stage is used to build a rich picture of the problem situation. The rich picture should consist of the structure and processes of the organization which it operates. The picture by structure is the physical layout, hierarchy, reporting structure, and the patterns of communication which may be formal and informal. The picture by process is the organization's basic activities such as resource allocation, deployment, monitoring, and control. The relation between the structure and process of the rich picture should demonstrate the problems, tasks, and elements of the environment in a comprehensive manner. The second stage should identify the relevant themes, develop a shared understanding of different perspectives, and form a basis for further discussion (Checkland, 1981b).

Stage 3: Look at Roles, Define What Needs to be Done – Root Definition

Stage 3 is generally the most difficult part of the process. A root definition is required, which is a statement defining what is relevant to the system and who is either affected by it or could affect it. The root definition is built using the mnemonic CATWOE, as shown below:

- a) C: customer - Who will be the victims/beneficiaries of the purposeful activity?
- b) A: actors - Who will perform the activities?
- c) T: transformation process - What is the purposeful activity expressed as Input and Output?
- d) W: Weltanschauung - What is the world view that makes this definition meaningful?
- e) O: owner - Who can stop this activity?

- f) E: environmental constraints - What are the environmental constraints faced by the system?

The core of the root definition lies in the transformation process, which changes inputs (logical or physical concrete or abstract) into outputs. Inputs and outputs are expressed as nouns in SSM and can be transformed by actions which are not transformed. There are five criteria in which the transformation process is judged, namely:

- Means that justify the ends of the transformation process
- Consideration of the resources
- Effectiveness of the transformation process
- Ethicality of the transformation process
- Elegance of the transformation process

The next step involves the construction of a conceptual model once Stage 3 is completed.

Stage 4: Construct Conceptual Model(s)

Conceptual model is not a description of the real world. It is built to understand the activities that require to bring upon changes, and to conceptually construct a system that represents stakeholders' perspectives about the desired system and associated human activities (Checkland & Scholes, 1990). The conceptual model is measured against the five criteria stated in Stage 3 above. The conceptual model shows the relationship between activities, corresponding to the CATWOE mnemonic. All of the elements of the CATWOE mnemonic must be included somewhere in the conceptual model, otherwise the conceptual model is incomplete. It should not be possible to take out words from the root definition without affecting the conceptual model (Platt & Warwick, 1995).

Stage 5: Compare Conceptual Model(s) with Real World Problem Situation

The conceptual model(s) constructed in Stage 4 gives a meaningful structure on the problem situation and it highlights the differences between the actual situation and perceived reality. Discussions on this model allow participants to re-think their assumptions and discuss improvement changes in the problem situation. This discussion leads to Stage 6.

Stage 6: Determine Desirable and Feasible Changes

The target of this stage is to explore desirable and feasible changes. Checkland (1981b) described three types of changes, consisting of changes in structure, procedures and attitudes. Changes in structure are referred to organizational groupings, reporting structures or structures of functional responsibilities. Changes in procedures include all the activities carried out within the organization, such as operational processes and reporting conventions. Changes in attitude refer to changes in the expectations that people have on the behaviour of other actors as well as changes in their readiness to rate certain kinds of behaviour as bad or good, relative to others.

Stage 7: Making changes to improve the situation

Stage 7 is the implementation step, which relates to the person responsible in taking the action and the types of action that should be taken. In addition, timetables, resources and scope are of primary importance. Behavioural changes need to be considered along with the impacts and effects on current systems. It is highlighted that change should not be made for the sake of a change. This stage searches for solid commitment and responsibility, as well as to organize the action plan.

Table 3.1 shows the epistemology of SSM (Checkland and Scholes, 2000, pp. 288-289).

The terms used in the language of SSM are defined in Table 3.1. This epistemology has been matched with the system and the details will be explained in Chapter 4.

Table 3.1: Epistemology of SSM

Epistemology of SSM	Details
Real world	The unfolding interacting flux of events and ideas experienced as everyday life
System thinking world	The world in which conscious reflection on the 'real world' using systems ideas takes place
Problem situation	A real-world situation in which there is a sense of unease, a feeling that things could be better than they are, or some perceived problem requiring attention
Analysis one, two and three	<p><i>Analysis One:</i> examination of the intervention or interaction in term of the roles; 'client' (caused the study to take place), 'problem solver' (undertakes the enquiry) and 'problem owner' (plausible roles from which the situation can be viewed, chosen by the 'problem solver')</p> <p><i>Analysis Two:</i> examination of the social (cultural) characteristics of the problem situation via interacting roles (social positions), norms (expected behaviour in roles) and values (by which role-holders are judged)</p> <p><i>Analysis Three:</i> examination of the power-related (political) aspects of the problem situation via elucidation of the 'commodities' of power in the situation</p>
Rich pictures	Pictorial/diagrammatic representations of the situation's entities (structures), processes, relationships and issues
Root definitions	Concise verbal definitions expressing the nature of purposeful activity systems regarded as relevant to exploring the problem situation. A full RD would take the form: do X by Y in order to achieve Z
CATWOE	Elements considered in formulating root definitions. The core is expressed in T (transformation of some entity into a changed of form of that entity) according to a declared <i>Weltanschauung</i> , W. C (customer): victims or beneficiaries of T. A (actors): those who carry out the activities. O (owner): the person or group who could abolish the system. E (the environmental constraints which the system takes as given)
Conceptual Model	The structured set of activities necessary to realize the root definition and CATWOE, consisting of an operational subsystem and a monitoring and control subsystem based on the Es
Comparison	Setting the conceptual models against the perceived real world in order to generate debate about perceptions of it and changes to it

	which would be regarded as beneficial
Desirable and feasible changes	Possible changes which are (systematically) desirable on the basis of the learned relevance of the relevant systems, and (culturally) feasible for the people in the situation at the time
Action	Real-world action (as opposed to activity in conceptual models) to improve the problem situation as a result of operation of the learning cycle for which this epistemology provides a language

Source: Checkland, P and Scholes J, "Soft System Methodology in Action" pp.288-289

3.3 Use of SSM in Research

Ever since SSM was developed 30 years ago, SSM has operated in many applications such as National Health Service, civil service, computer industry and product marketing division (Checkland & Scholes, 1999). SSM deals with problem formulation at the strategic level. SSM partly aims to structure previously unstructured situations, rather than solving well-structured problems. SSM deals with "fuzzy" problem situations, in which people are viewed as active subjects rather than passive objects, where objectives are unclear or where multiple objectives may exist (Rosenhead, 1989).

Amongst the first practical usage of SSM was the National Health Service (NHS) Study in 1984. Established in 1948 as a tax-funded service freely available to all, the UK's NHS is the country's largest employer, with nearly a million staff (Checkland & Scholes, 1999). SSM was implemented to investigate three cases, namely, the dependence between health of the local population, the cost of health services as well as the efficiency of regional health services (Pesi & Hrebicek, 2003). Tested models were proposed and were found to be appropriate. The models are incorporated into the system model to evaluate various healthcare projects.

Warwick & South (2008) used SSM as a tool to facilitate the review of a taught mathematics module so that the views of those engaged with the module could be captured, and the conflicting expectations and views highlighted. Warwick & South (2008) obtained a reflective review of the mathematics module, which forms part of the first year curriculum of an undergraduate computing studies programme at London South Bank University (LSBU).

In addition, another application of SSM is in a case study at a purchasing department as reported by Bjerke (2008). The SSM was implemented for financial reporting at Volvo Cars Corporation (VCC). VCC envisioned a possible opportunity to improve their reporting processes, and SSM was chosen to deal with this possible problematic situation. Action Research became a natural method of conducting the study since it is almost a mandatory way of conducting SSM. Delimitation was made due to limited resources and only a small portion of the purchasing department was involved, namely, electrical purchasing. The results showed that the artifacts from the different steps of SSM demonstrated how the participants would like the reporting system to be as well as many issues with the current reporting process. These outputs were regarded as successful by both practitioner and participants. The method was considered to be effective for this case.

In the context of Information Science, SSM has been applied in a various activities. The application of SSM in the industry was one of the early occasions that require by Checkland and his colleague Pering to assist Belshaw from the Organics Division of ICI in the Information and Library Services Department (ILSD) Project. At the end of his career, he was asked to head the ILSD project with regards to management, re-thinking of roles'

refurbishment. The project consisted of two main objectives, i.e., “doing more with fewer resources” and “to upgrade the problem solving capability of ILSD”. (Checkland & Scholes, 1999). Consequently, there were changes to structure, procedures and attitudes enacted and investments made in information technology.

Brember (1985) utilized SSM in a medical library to investigate library effectiveness. SSM was particularly used to relate user survey findings with library management (Brember, 1985). With several data collection techniques, the investigation was focused on library, library manager and users. The emergent concept of library was described as something which “converts unsatisfied information needs to satisfied needs”. This was achieved by providing organized information, enabling retrieval of selected information and facilitating its use (Brember, 1985).

Hernando (1997) employed SSM to investigate improvements in nursing. Libraries were initially viewed as support services for academic courses, rather than the first port of call for information specifically related to patient care. Delbridge (2008) used SSM to establish a framework of information service activity which informs the library management system (LMS) design. It was observed that most libraries selected LMS rather than developing systems based on needs. The results showed that LMS can be regarded as problematic in terms of serving the requirements of libraries and lacking in innovation. Hence, there is a need to focus on future LMS designs (Delbridge, 2003). The results highlighted the activities that should be and should not be supported by the system and as well as the development of a framework for information service activity.

SSM is recently implemented by the library staff at the California Polytechnic State University (Somerville & Mirijamdotter, 2005). SSM was chosen because it encourages recognition that parts are situated within a whole. In this case, the library outcomes must be determined within the context of the university's purpose. The applications of SSM outlined above demonstrate the use of this methodology in different organizational contexts and for different purposes.

3.4 Fitting SSM into Research

In this study, SSM is used as an approach for qualitative investigation. From the seven stages of SSM, five phases are identified to be within the research framework, as shown in Figure 3.4. The red circle represent the phases throughout this study.

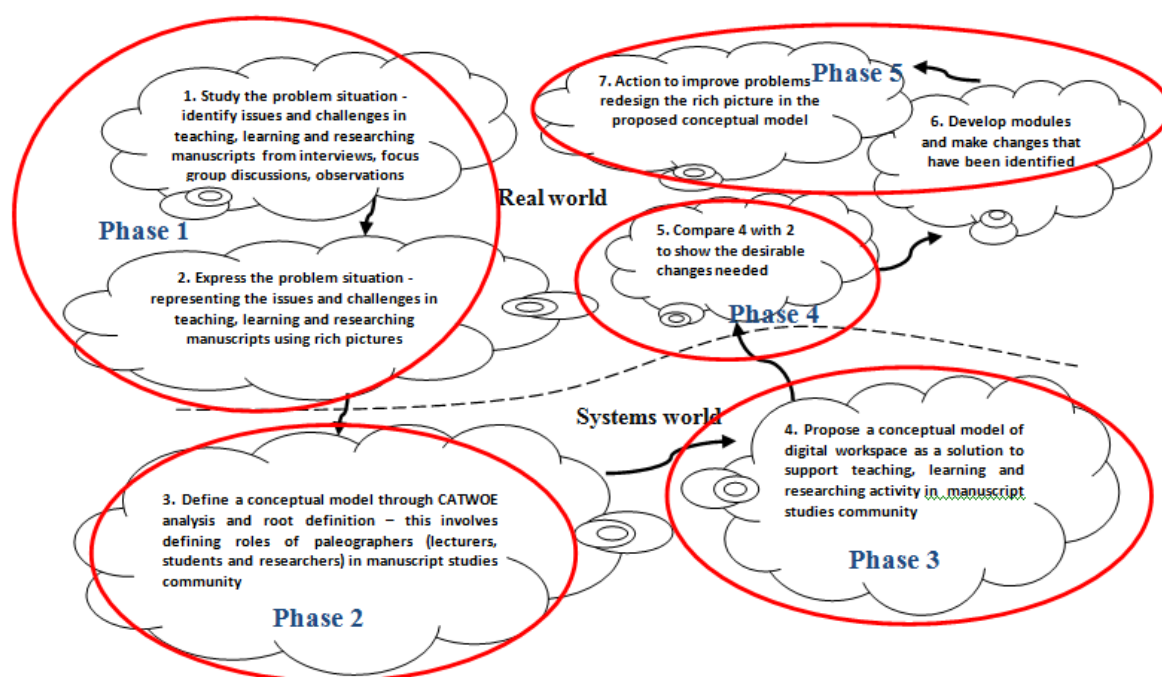


Figure 3.4: Application of the Seven Stages of SSM into the Current Study

The various stages of SSM can be applied accordingly to fit into the research framework (Oura and Kijima, 2002). Five phases are identified within the research framework as seen in Table 3.2.

Table 3.2: Implementation of SSM into Current Study

The Research Phase	The Original SSM Stages	The Research Component	Mapping with the Research Objectives
Phase 1: Unmasking the Problem Situation	Stage 1: Problem situation unstructured Stage 2: Expressing problem situation	Study the problem situation via qualitative research methodology using interviews, focus groups and observation.	1. To examine the current process of teaching, learning and researching manuscripts in Malay manuscript community
Phase 2: Unmasking the Problem Situation	Stage 3: Defining root definitions of relevant systems	Define a conceptual model through CATWOE analysis and root definition	2. To investigate what are the issues and challenges related to teaching, learning and researching in manuscript studies
Phase 3: Formulating the Conceptual Model	Stage 4: Constructing a conceptual model	Construct the conceptual model and proposed a solution	3. To propose a conceptual framework of a new environment (as a solution) that can support and improve the process of teaching, learning and researching in manuscript studies
Phase 4: Comparing, Identifying and Making Changes	Stage 5: Comparing conceptual model with the problem situation	Compare the conceptual model and the proposed solution with the problem situation	3. To propose a conceptual framework of a new environment (as a solution) that can support and improve the process of teaching, learning and researching in manuscript studies
Phase 5: Identifying Changes and Making Improvements	Stage 6: Identifying feasible and desirable changes Stage 7: Implementing action to improve the problem situation	Identify changes and make improvement to the problem situation	4. To evaluate the usability of the suggested solution and gain insight from the paleographers (lecturers, students and researchers) on its effectiveness.

3.4.1 Phase 1: Finding Out the Problem Situation

This study attempts to support teaching, learning and researching requirements of Malay manuscripts studies in an electronic environment. This study covers (but it is not limited to) the following types of areas:

- 1) Potential E-workspace modules
- 2) Current teaching, learning and researching behaviour
- 3) Potential users
- 4) Problems encountered
- 5) Usage of Malay manuscripts
- 6) Context and content of Malay manuscripts

This study explores their views on E-workspace and digital library of Malay manuscripts developed earlier, since it will be used as part of the Malay manuscript E-workspace system. Three methods are chosen for data collection as follows:

- 1) Interviews with lecturers, students and researchers
- 2) Focus group sessions with students and researchers
- 3) Observation sessions during *"Introduction to Philology"* course to observe the process of teaching and learning Malay manuscripts

"Introduction to Philology" course from Academy of Malay Studies (APM) is chosen as the study domain due to the following reasons:

- 1) APM is willing to participate in this study
- 2) APM offers a course that use Malay manuscripts as the course material

- 3) There is a significant number of researchers and experts in Malay manuscripts in APM

Table 3.3 summarizes data collection techniques used in this study. The following section describes each techniques and includes description of people (paleographers) involved in manuscript study activities carried out and the instruments used.

Table 3.3: Data Collection Techniques

Technique	Participants	Primary Method	Forms of Data
Interviews	Lecturers	Qualitative	Narrative Text
	Students		
	Researchers		
Focus Group sessions	Students	Qualitative	Narrative Text
	Researchers		
Class Observations	Lecturer	Qualitative	Narrative Text
	Students		
Evaluation of the E-Workspace prototype	Lecturers	Qualitative and Quantitative	Narrative Text and Numeric Data
	Students		
	Researchers		

Interviews

One of the data collection techniques used in this study was interview. Interviews can be highly structured, semi structured or unstructured (Hancock, 1998) however in qualitative research, interviews are either semi structured or unstructured. Semi structured interviews tend to work well when the interviewer has already identified a number of aspects to be addressed. This can be particularly important if time available is limited, and the interviewer wants to ensure that the the key issues are covered. On the other hand, unstructured interview refers to an in depth interviews that have very little structure. The interviewer conducts the interview session with the aim of discussing a limited number of

topics, sometimes as few as one or two, and frames the questions on the basis of the interviewee's previous response. Although only one or two topics are discussed are covered in great detail.

For unstructured interviews, interviewer normally intends to find out about a specific topic but has no structure or preconceived plan or expectation as to how they will deal with the topic (Hancock, 1998). This is different in semi structured interviews where the interviewer has a set of broad questions to ask and may also have some prompts to help the interviewee but the interviewer has the time and space to respond to the interviewees responses. In a semi structured interview the interviewer also has the freedom to probe the interviewee to elaborate on the original response or to follow a line of inquiry introduced by the interviewee. For the purpose of this study, informal semi structured interviews were carried out to fit a qualitative approach. In this case interviewees would feel as though they are participating in a conversation or discussion rather than in a formal question and answer situation.

Preparation

McNamara (2009) suggests the importance of the preparation stage in the interview is to maintain an unambiguous focus as to how the interviews will be erected in order to provide maximum benefit to the proposed research study. McNamara (2009) applies eight principles to the preparation stage of interviewing which includes the following elements:

- Choose a setting with little distraction
- Explain the purpose of the interview
- Address terms of confidentiality

- Explain the format of the interview
- Indicate how long the interview usually takes
- Tell them how to get in touch with the researcher later if they want to
- Ask them if they have any questions before the researcher both get started with the interview
- Do not count on memory to recall their answers

Questions

The open ended nature of the question defines the topic under investigation but provides opportunities for both interviewer and interviewee to discuss some topics in more detail. If the interviewee has difficulty answering a question or provides only a brief response, the interviewer can use cues or prompts to encourage the interviewee to consider the question further (Turner, 2010). Creating effective research questions for the interview process is one of the most crucial components to interview design. Researchers desiring to conduct such an investigation should be careful that each of the questions will allow the examiner to dig dip into the experiences and/or knowledge of the participants in order to gain maximum data from the interviews. McNamara (2009) suggests several recommendations for creating effective research questions for interviews which includes the following elements: (a) wording should be open-ended (respondents should be able to choose their own terms when answering questions); (b) questions should be as neutral as possible (avoid wording that might influence answers, e.g., evocative, judgmental wording); (c) questions should be asked one at a time; (d) questions should be worded clearly (this includes knowing any terms particular to the program or the respondents' culture); and (e) be careful asking "why" questions. In this study, the questions are printed

on the summary sheets, along with columns for additional notes and comments. The data collected are compiled prior to the analysis process. Appendix B shows the interview protocol throughout this study.

Participants

Creswell (2007) discusses the importance of selecting the appropriate candidates for interviews. He asserts that the researcher should utilize one of the various types of sampling strategies such as criterion based sampling or critical case sampling (among many others) in order to obtain qualified candidates that will provide the most credible information to the study. Creswell also suggests the importance of acquiring participants who will be willing to openly and honestly share information or “their story” (p. 133). It might be easier to conduct the interviews with participants in a comfortable environment where the participants do not feel restricted or uncomfortable to share information.

In this study, interview sessions are carried out with individuals who studying manuscript in Malay manuscript community. These individuals are known as paleographers which comprises of lecturers who are teaching Malay manuscript courses, students who learning about manuscripts and researchers who conducting research on Malay manuscripts. The primary aim of the interview is to examine the process of teaching, learning and researching manuscripts and to investigate the issues and challenges paleographers face while studying manuscripts. Appendix B exhibits the interview protocols and summary sheet used during the interview sessions. These documents have facilitated the researcher to conduct the interviews in a systematic manner.

Pilot test

Another important element to the interview preparation is the implementation of a pilot test. The pilot test will assist the research in determining if there are flaws, limitations, or other weaknesses within the interview design and will allow him or her to make necessary revisions prior to the implementation of the study (Kvale, 2007). A pilot test should be conducted with participants that have similar interests as those that will participate in the implemented study. The pilot test will also assist the researchers with the refinement of research questions.

Focus Groups Sessions

The key stages of the focus group sessions are as follows:

- 1) Familiarisation: This is the step in which the transcription of the data needs to be read. The steps need to be repeated again and again until we get familiar with the whole discussion.
- 2) Identifying a Thematic Framework: This is the initial coding framework which is developed both from a priori and emerging issues from the familiarisation stage. This thematic framework should be developed and refined during subsequent stages.
- 3) Indexing/coding: The process of applying the thematic framework to the data, using numerical or textual codes to identify specific pieces of data which correspond to differing themes.
- 4) Charting: This involves using headings from the thematic framework to create charts of the data so that it can easily read across the whole dataset. Charts can be either

thematic for each theme across all respondents (cases) or by case for each respondent across all themes.

- 5) Mapping and Interpretation: This refers to the process of searching for patterns, associations, concepts, and explanations in the data, aided by visual displays and plots. Ritchie and Spencer, (1994) suggested that at this stage, the qualitative analyst might be aiming to define concepts, map the range and nature of phenomena, create typologies, find associations within the data, provide explanations or develop strategies. They emphasized that the areas which the analyst chooses to focus on the themes that emerging from the data and original research question. They aim that *'this part of the analytical process is the most difficult to describe'*. The central aim of these techniques is to visually display ideas from the data as an aid in developing and testing interpretations. This step is carried out when data collection methods is completed. This is whereby all information required from the interview sessions, the focus group discussions and observations are gathered. The results (themes) are mapped to the proposed modules for the electronic workspace system of Malay manuscripts community.

In this study, the focus group sessions are conducted in three phases with the paleographers in order to obtain consistent answers gathered from interview sessions. A focus group is a qualitative data collection method in which one or two researchers and several participants meet as a group to discuss a given research topic. These sessions are usually tape-recorded and sometimes video-taped (Mack et al., 2005). It is also helpful to practice moderating a pilot or mock focus groups. The mock focus group session, other project staff play a role as a participant, enables the interviewer to test his/her knowledge, as well as the interviewer's

ability to probe and keep the discussion on track, as well as flexibility. Practice focus groups may also be conducted with people in the community who are not the participants in the study. In such cases, informed consent needs to be obtained first, similar to obtaining consent from someone in the study (Mack et al., 2005).

This study requires inputs from Malay manuscript paleographers regarding their current process of teaching, learning and researching the problems and their views on E-learning. Unlike the previous interviews sessions, focus group is targeted to retrieve a wealth of detailed information and in-depth insight. Focus group enable researcher to understand the phenomena or situation at a deeper level by putting participants at ease and allow them to thoughtfully answer questions in their own words and add meaning to their answers (Elliot, 2005). In this study, focus groups enable the researcher to obtain a richer picture on how APM students conduct the process of learning in Malay manuscript studies.

Unlike interviews, focus group is a data collection method from groups of people rather than a series of individuals. This method is appropriate when it is difficult to collect information with other methods. In this study, focus group is required to obtain an in-depth understanding on the subject matters. When well-executed, focus group creates an accepting environment that enables participants to carefully answer questions using their own words, making the responses meaningful.

Demographic Survey and Questions

The demographic survey is vital to retrieve basic information of each participant. The answers given may be influenced by their background such as their parents' occupations as

well as their educational background before tertiary level. Figure 3.5 shows the demographic questions for the focus group participants.

Focus Group Participant Demographics		
Date:	Time:	Place:
How long you have involved in Malay manuscripts studies? <ul style="list-style-type: none"> ○ Less than 3 years ○ 3-8 years ○ More than 8 years 	Have you attended the Philology class? If yes, when? <ul style="list-style-type: none"> ○ No ○ 1st sem of 2008/2009 session ○ 2nd sem of 2008/2009 session ○ 1st sem of 2009/2010 session 	Where do you practice the Malay manuscript study? (you can choose more than one answer) <ul style="list-style-type: none"> ○ University ○ Public ○ Private
Your gender: <ul style="list-style-type: none"> ○ Male ○ Female 	Your Age: <ul style="list-style-type: none"> ○ 18-20 ○ 21-23 ○ 24-26 	What is your major in Academy of Malay Study? <ul style="list-style-type: none"> ○ Literature(<i>Sastera</i>) ○ Art (<i>Kesenian</i>) ○ Language (<i>Bahasa</i>) ○ Others (pls specify): _____
What is your parents' occupation? _____ _____	How long are you experience with ICT? <ul style="list-style-type: none"> ○ Never ○ 0-5 years ○ 6-10 years ○ More than 10 years 	Where is your hometown? _____

Figure 3.5: Demographic Survey Questions

There are three sections of questions, namely, engagement questions, exploration questions and exit questions (Elliot, 2005). The questions from the focus group discussions are listed below. The answers are simplified based on the similarities between the participants'

answers. Follows are the main questions that being asked to participants (students and researchers), further questions that rose after each of the questions are not stated here.

Engagement Questions

1. Why do you take this course/research?
2. When did you start to learn *Jawi*?

Exploration Questions

3. What is the type of manuscript used during teaching and learning/researching classical Malay literature?
4. Who are the stakeholders in the teaching and learning/researching process of Malay manuscripts?
5. How are the contents of the manuscripts used and what are the purposes?
6. When do researchers/students and lecturers need to use Malay manuscripts? What is the motivation for using the manuscripts?
7. What are the problems encountered by instructors and learners/researchers of Malay manuscripts?
8. Basically, what is the process for researchers/students to study and understand Malay manuscripts?

Exit Questions

9. Is there anything else that you would like to comment on the improvement of environment for Malay manuscript studies?

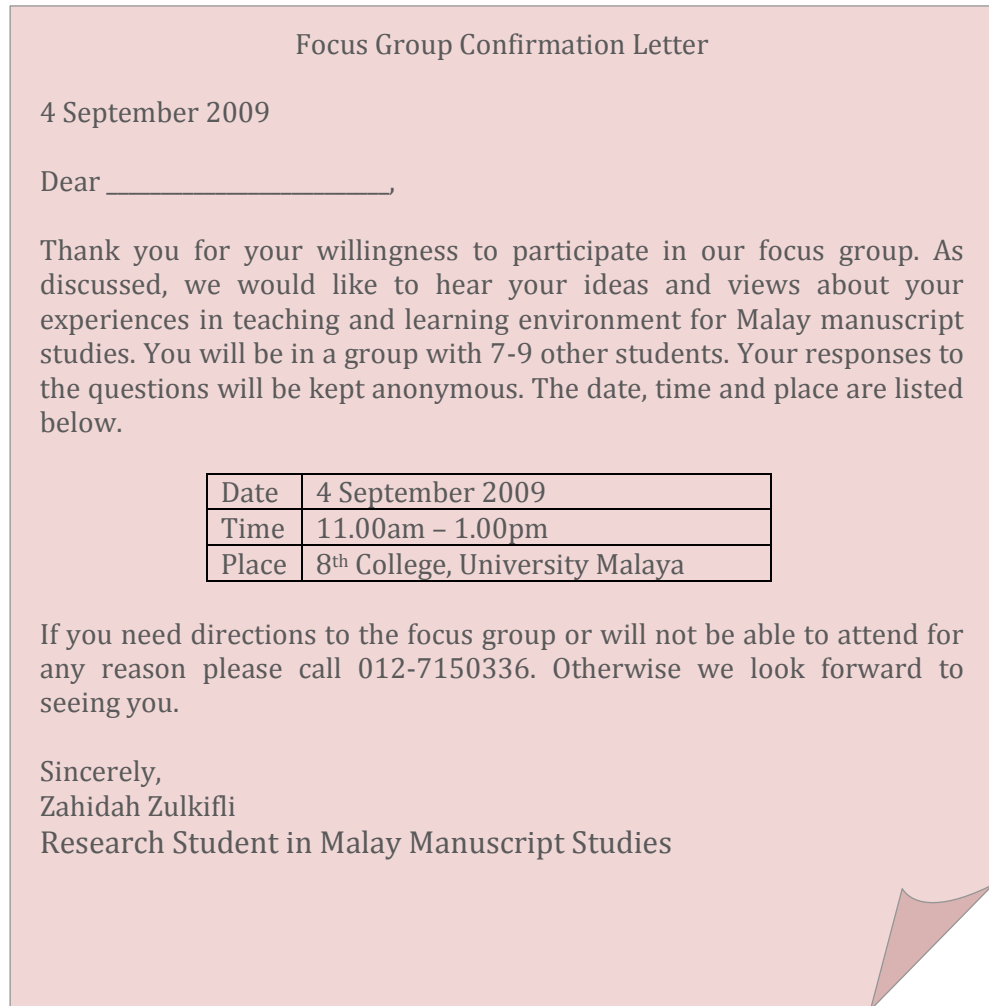
Participants

Case study focuses on the teaching, learning and researching process in a philology course, in APM, UM. Hence, the participants are selected amongst students who have attending the course and researchers who are involved in Malay manuscripts research. There are

different arguments regarding the number of participants in a focus group. Elliot (2005) stated that a focus group should consist of 6-10 people, whereas Greenbaum (1998) suggested 8-10 people. In this study, the focus group consists of 8 students who are suggested as one of the interviewees during the interview session.

Focus Group Confirmation Letter

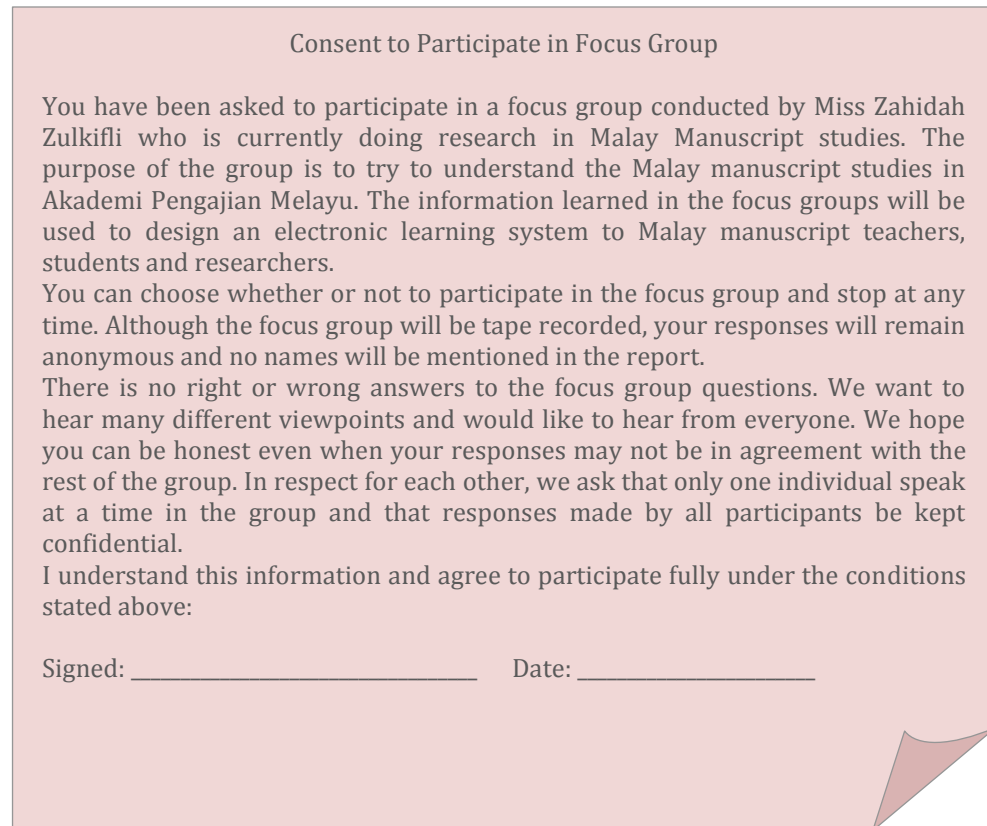
A confirmation letter is needed once the focus group participants have been established. The letter includes information on the time and location of the focus group session as shown in in Figure 3.6. Appendix D shows the focus group protocols that being used throughout the sessions.



Source: "Guidelines for Conducting a Focus Group", Elliot and Associates, (2005)

Figure 3.6: : Focus Group Confirmation Letter

Consent to Participate



Consent to Participate in Focus Group

You have been asked to participate in a focus group conducted by Miss Zahidah Zulkifli who is currently doing research in Malay Manuscript studies. The purpose of the group is to try to understand the Malay manuscript studies in Akademi Pengajian Melayu. The information learned in the focus groups will be used to design an electronic learning system to Malay manuscript teachers, students and researchers.

You can choose whether or not to participate in the focus group and stop at any time. Although the focus group will be tape recorded, your responses will remain anonymous and no names will be mentioned in the report.

There is no right or wrong answers to the focus group questions. We want to hear many different viewpoints and would like to hear from everyone. We hope you can be honest even when your responses may not be in agreement with the rest of the group. In respect for each other, we ask that only one individual speak at a time in the group and that responses made by all participants be kept confidential.

I understand this information and agree to participate fully under the conditions stated above:

Signed: _____ Date: _____

Figure 3.7 : Consent to Participaants the Focus Group

All participants are requested to complete a consent form as shown in Figure 3.7 This step is important to ensure their attendance during the focus group sessions.

Focus Group Introduction

A script to welcome participants and to remind them the purpose of the group as well as the ground rules is prepared. The introduction can be seen in Appendix D.

Pilot test

A draft of the questions for the interview and focus group sessions were distributed to selected lecturers, researchers and students. This is to verify that the questions can be mapped into a correct performance indicator.

Observations

Observations were carried out during ‘Introduction to Philology’ course was conducted from 12th January – 16th April 2010. The class was divided into two sections, where the first section consisted of lectures sessions and the second section comprises of tutorials sessions. Only the tutorial section was observed based on recommendations of the lecturer in order to fulfill the research objectives. A total number of students in the course were 46 and they were divided into two tutorial classes. The tutorial class chosen for the observation was held on every Tuesday, from 11am-1pm. Figure 3.8 and Figure 3.9 shows observation form and summary sheet used as the guideline for observations activity. The observation protocol can be seen in Appendix E.

Background Information
Name:
Name of place of observation:
Name of participation/ people involved:
Topic of observation:
Date/day:
Time:
No. of observation:

PROTOCOL FOR OBSERVATION

Guidelines	Observation notes (which include observer's comment/s)	Observer's notes/reflection
Description of the following: 1. Place/surrounding, environment, ambience and facilities: 2. People- primary and secondary participants 3. Events 4. Activities		

Figure 3.8: Observation Form

After the data collection process, in order to get the final result, the data will be analyzed by using the qualitative data analysis that had been chosen. The results from the data analysis are a list of themes, and the themes will be presented in a rich picture in order to get a good picture and feel about the problematic situation that had been investigated. Further discussion on the data analysis is in section 3.5.

OBSERVATION SUMMARY SHEET	
<p>INSTRUCTION: After each observation, the researcher has to do the following:</p> <ol style="list-style-type: none"> 1. Read through your expanded fieldnote, and observation notes. 2. Analyze the transcribed interview (and refer to the fieldnotes if necessary) 3. Analyze them using the guidelines provided. 4. Using the same guidelines write the complete interview summary sheet. 5. Please refer to the research questions when doing the analysis and preparing the contact summary sheet. 	
<p>GUIDELINES</p> <p>Name of organisation/place:</p> <p>Name of participant/s:</p> <p>Venue:</p> <p>Date/Time/No. of contact:</p> <p>Summary of the observation data/contact</p> <ol style="list-style-type: none"> 1. What were the main issues/themes that struck you in this observation? 2. Summarize the information you got (or failed to get) on each of the target questions you had for this observation. 3. Anything else that struck you as salient, interesting, illuminating or important for this observation? 4. What new/emerging issue/s or (remaining target questions) do you have in considering the next contact with this site? What to look for/ who/ how/ why? 	<p>The Summary</p> <p>*You can have more than one page (but not more than two pages) depending on your need.</p>

Figure 3.9: Observation Summary Sheet

3.4.2 Phase 2: Defining the Root Definition

Root definition is constructed from the relevant human activity system that had been identified in Stage one and Stage two in SSM. In this study, the root definition is generated from the rich picture. The root definition should encompass the emergent properties of the system in question (Platt & Warwick, 1995). It is a short paragraph that contains all the necessary information to describe the system. In this chapter, the partial root definition is

presented, while the final root definition is presented in Chapter 4 when all the data collected has been analyzed.

The partial root definition for this study is as follows:

An instructor/lecturer owns an operated system to provide a conducive medium for teaching, learning and researching, by giving them assignments through potential E-learning tools such as transliteration and annotation tools in order to support collaboration work amongst researchers/lecturers/students and people who are involved in Malay manuscript studies through a digital environment.

The CATWOE mnemonic can be used as a checklist to ensure that the root definition is complete or alternatively, the root definition can be formulated from the components of the CATWOE mnemonic. CATWOE analysis is a technique devised by Checkland (1981) to aid the formulation of coherent and comprehensive root definitions. Like root definition, the CATWOE analysis in this chapter only represent the partial CATWOE analysis as the final one will be generated once all the data had been collected and analyzed in Chapter 4.

The partial CATWOE analysis for the problem situation is shown in **Table 3.4**.

Table 3.4: Partial CATWOE Analysis of Problem Situation

Element of CATWOE	Description	CATWOE Analysis for this study
Customers	Who are the victims or beneficiaries of the transformation?	Paleographers (Malay manuscript lecturers, students and researchers) The public accessing Malay manuscript collections
Actors	Who makes the transformation happen?	The manuscript librarians in charge of governing Malay manuscript collections
Transformation	What are the inputs and (transformed) outputs?	Current environment of teaching, learning and researching Malay manuscripts to an accommodating environment
Weltanschauung	What makes the transformation meaningful in context?	A conducive medium for teaching, learning and researching Malay manuscripts that support interactive and collaborative works in a digital environment
Owners	Who could stop the transformation process?	FCSIT or collaborating Malay manuscript repositories in Malaysia
Environmental Constraints	Which elements outside the system are taken as given?	Technology use and acceptance Collaboration between researchers

3.4.3 Phase 3: Formulating the Conceptual Model

The conceptual model is not a description of the real world. It is actually built to understand the activities that require to bring upon changes, and to conceptually construct a system that represents stakeholders (for this study it refers to paleographers) perspectives about the desired system and associated human activities (Checkland & Scholes, 1990). The development of the conceptual model is based on CATWOE and the root definition that has been decided during Phase 2. This allows the actors to achieve the transformation put forward in CATWOE. The conceptual model includes all activities that need to take place to enable the actors (refer to Table 3.4) to achieve the desired transformation and all these activities need to be carried out within a system boundary. The conceptual model only depicts the activities undertaken by the actors (refer to Table 3.4) as defined in the root definition and this would normally be limited to a group of people only. When more

than one group is involved, monitoring becomes a problem. The conceptual model are therefore represents only the desired human activities. Further discussion on this phase is reported in Chapter 5.

3.4.4 Phase 4 And Phase 5: Comparing, Identifying And Making Changes

In order to fulfill the requirement in phase 4 and phase 5, usability testing on the proposed solution (a prototype of the E-Workspace) was conducted. A comparison between the real world (current manuscript study) and the system world (the proposed E-workspace for manuscript study) was done as reported in details in Chapter 6.

The Usability Testing

The purpose of system usability testing is to find problems and make recommendations to improve the utilization of the proposed solution during its design and development. This system usability testing is conducted to three target respondents. The first session is focused on researchers who are currently carrying out research in Malay manuscripts area. The second session is devoted on students who have experienced attending the Malay manuscript courses whereas the third session is focused on lecturers who are teaching Malay manuscript courses.

Selection of Actors

- **Participants:** Participants are those who will interact with the selected texts and whose feedback, derived through a variety of techniques (see below), forms the results of the experiment.

- Evaluator: Evaluator is the people who devises the usability techniques, arranges and supervises the usability session(s), and conducts interviews and think-aloud sessions.
- Task developer: Developer is one who devises and sets tasks for the participant to carry out, using the selected texts.
- Assessor: Assessor is the person who accumulates and interprets the evaluative data provided by the participant.

Tasks and Questions

The usability evaluation is performed based on five dimensions, namely efficiency, effectiveness, engagement, error tolerance and ease of learning (Quesenbery, 2003). These dimensions have been used over e-learning systems and it is found that these dimensions fit best with this study since they are closely related to electronic teaching and learning environment. It is generally accepted that an operational definition of usability includes one or more of the following four factors, as follows:

1) Effectiveness

Effectiveness refers to the completeness and accuracy users can achieve when completing the main tasks in transliterating manuscripts. When carrying out the given tasks users have been observed to be able to successfully and correctly complete the transliteration task. E-learning products should be designed to achieve a high level of productivity. Effectiveness, measured in terms of speed and error, refers to levels of user performance (Lindgaard, 1994; Shackel, 1991). After learning an e-learning system, users should become more expert at using them over time (Robertson, 1994).

2) Efficiency

In this study efficiency refers to how quickly and directly users can complete a given task. Navigation design elements such as keyboard shortcuts, menus, links and other buttons is considered to have an impact on efficiency. Therefore, when they are well-designed, less time and effort are needed for user to navigate and choose actions. It has been observed from the evaluation session that fixed menus and navigation facility have prevented participants from getting lost in the system although some participants were referring to the help menu several times in order to complete the given task.

3) Engagement

Engagement refers to the degree of which the system interface is pleasant, satisfying and enticing to use. An E-learning system should be enjoyable to use and aesthetically pleasing to users. It should be within acceptable levels of user cost in terms of tiredness, discomfort, frustration, and individual effort so that satisfaction causes continued and enhanced usage of e-learning system (Lindgaard, 1994). Motivational elements including typographical cueing, color, graphical images, animation, and sound in the interactive e-learning system can motivate the user and increase satisfaction, but follow the principles of motivational design elements (Lee & Boling, 1996).

4) Error Tolerance

Error tolerance refers to a function that allows equipment to continue functioning in the presence of any faults. It is desirable that users do not make many errors during the use of system. Design accommodations should be made so that when errors do occur, users can

easily recover from them (Nielsen, 1990a; Robertson, 1994). System integrity is the prevention of data corruption or loss (Reed, 1992). No critical errors must occur in order to meet high integrity of a system. In the system testing, error tolerance is tested by using the system and/or system integrity for preventing data corruption and loss.

5) Ease of Learning

Ease of Learning refers to variations in task-completion strategies supported by a system. The freedom to use a range of different commands with which to achieve similar goals adds to the system flexibility although not necessarily to the learnability for new users (Lindgaard, 1994). Effects of flexibility may be measured by differences in performance as a function of absence or presence of added features in the E-learning system.

The general dimensions of the usability described above are summarized in Table 3.5. These dimensions are used to capture valuable information for improving the quality of a system in the process of production, with the categories of usability defects as suggested by Lindgaard's (1994). Designers can choose the usability defect categories in terms of user, task and environment.

Table 3.5. Dimensions of Factors for Usability Testing

Dimension	Description
Effectiveness	The completeness and accuracy with which users achieve their goals
Efficiency	How quickly and directly users can complete their goals
Engagement	The degree of system interface is pleasant, satisfying and enticing to use
Error tolerance	How well the Workspace design could prevent errors or provide assistance for recovery which is normally done by providing information, choices of actions to correct the problem, or other solutions
Ease of Learning	How well the workspace supports both initial use and extending for a deeper understanding

Techniques

Focus Group Discussions

The objective of the focus group is to identify how acceptable the concepts are, in what ways they are unacceptable or unsatisfactory, and how they might be made more acceptable (Rubin, 1994).

The usability testing was conducted using a task-based approach in the first phase then followed by a focus group discussion in the following phase. The first phase required participants to complete the tasks given within one hour time. Eight students were gathered in a computer lab to carry out the usability test. They were required to log-in to the e-workspace and complete the given tasks. The tasks are generated according to the modules in the e-workspace. In the second session they will be gathered in a focus group discussion group, and the questions are given and discussed. The questions are categorized according to the Quesenbary's (2003) dimensions; Effectiveness, Efficiency, Engagement, Error tolerance and Ease of Learning.

In the second session they will be gathered in a focus group discussion group, and the questions are given and discussed.

3.5 Data Analysis

Thematic analysis focuses on identifiable themes and patterns of living and/or behavior. The first step is to collect the data. Audiotapes should be collected to study the talk of a session. All the collected data need to be transcribed and in this study, the data collection process is 100% in Malay language, therefore the process of translation to English language is needed for thesis standardization. Then, the process continues with reading the first interview/focus group transcripts, the first set of observation field notes in the study. As the transcripts had read down through, notes and comments are jotted down. These notations are potentially relevant and important to the study. This process of making notations that are potentially relevant to answer the research questions is called coding. Assigning codes to pieces of data is the way to begin the categories construction. After working through the entire transcript in this manner, the notes and comments (codes) are looked back over to and those comments and notes that seem to go together are grouped (Merriam, 2009).

In this study, there are several set of data that obtained from the interview, focus group and observations. The same process goes to other set of data, while keeping in mind the list of groupings that had been extracted from the first transcript and check to see whether they are also present in the second set. A separate list of notes and comments from the second set are compared to the list that derived from the first transcript. These patterns are recurring for other data set until all of them are merged into one master list. This master list reflecting the recurring regulatory or pattern in the study. The categories/themes

constructed from the recurring pattern that cuts across the data. The process of thematic analysis is shown in Figure 3.10. The derived themes need to be supported with evidences and in this study, the interview/focus group quotes and observation field notes are being used as the evidences.

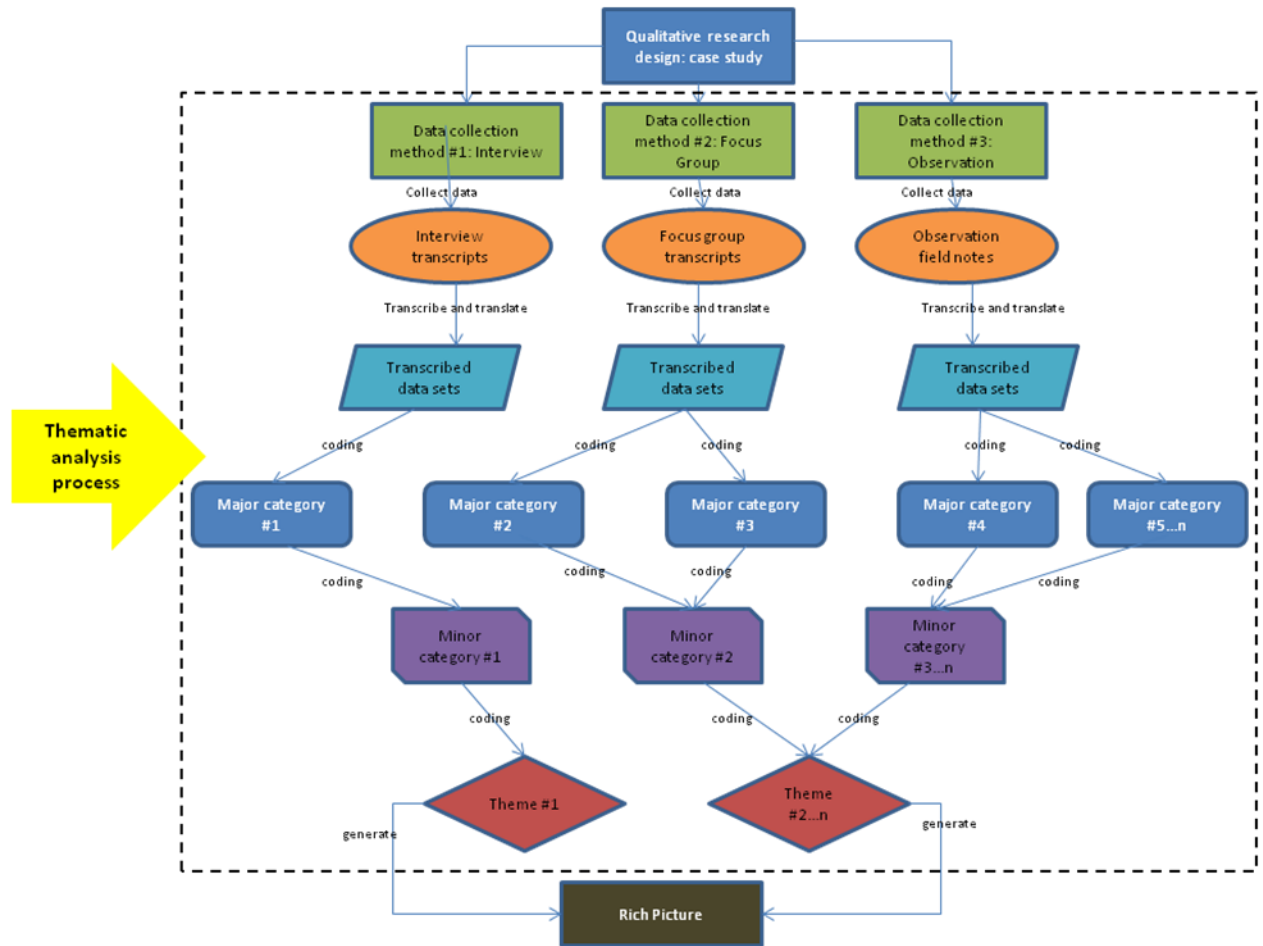


Figure 3.10: Thematic Analysis Process

From the themes, the rich picture is generated that gives a pictorial description of the situation under investigation and provides a focal point for further discussion and analysis. From this rich picture some issues and problems can be drawn out (Warwick, 2008). The step of generating the rich picture is not the final step in SSM. After the rich picture is

drawn out, a root definition is generated and a CATWOE analysis is conducted, and as a result, a conceptual model is presented. This will be discussed in details in the Chapter 4.

3.6 Research Reliability and Validity

Research reliability is the extent to which research findings can be replicated. In the other words, if the study were repeated would it yield the same results? While the Research validity is refers on how research findings match reality. The connection between the reliability and validity is that a study is more valid if repeated observations in the same study or replications of the entire study produce the same results (Merriam, 2009).

The reliability of the collected data, through the coding of the interview and focus groups transcriptions, as well as the observation procesess can be tested trough an intercoder reliability check. In order to assess the reliability of the coding at least two different researchers must code the same body of content (Mouter, Noordegraaf, 2012). In this research, the second researcher is refers to the supervisor. As the result, both researchers reach the same conclusion (list of themes) after doing the thematic analysis processes.

Another well known strategy to shore up the validity of a study is known as triangulation. Denzin's (1978), proposes four types of triangulation; the use of multiple methods, multiple data sources, multiple investigators or multiple theories. Triangulation is typically a strategy (test) for improving the validity and reliability of research or evaluation of findings. Then triangulation is defined to be "a validity procedure where researchers search

for convergence among multiple and different sources of information to form themes or categories in a study” (Creswell & Miller, 2000, p. 126).

In this study, triangulation using multiple methods of data collection and triangulation using multiple sources of data are applied as shown on Figure 3.11. The use of multiple methods of data collection means that what someone tells during an interview can be checked against during the focus group discussions and can be checked against what is being observed on site. Thus, triangulation by using three methods of data collection; interview, focus group and observations are employed. Triangulation using multiple sources of data means comparing and cross checking data collected through observation at different times or different places, or interview data collected from people with different perspectives or from follow-up interview with the same people (Merriam, 2009). In this study, the data collection techniques are interview, focus group and observation that are conducted to three different types of respondents; lecturers, students and researchers. For example, data collection from students is obtained from interview, focus group and observation and each of the technique are applied in several times in order to get the data consistency. The individual interview with students is held in 2-4 times for each student, the focus group amongst students are held in 3 times and the class observations are held in 14 times. The use of multiple methods of collecting data (methods triangulation), can be seen as a strategy for obtaining consistent and dependable data. The details on the data collection processes will be discussed in Chapter 4.

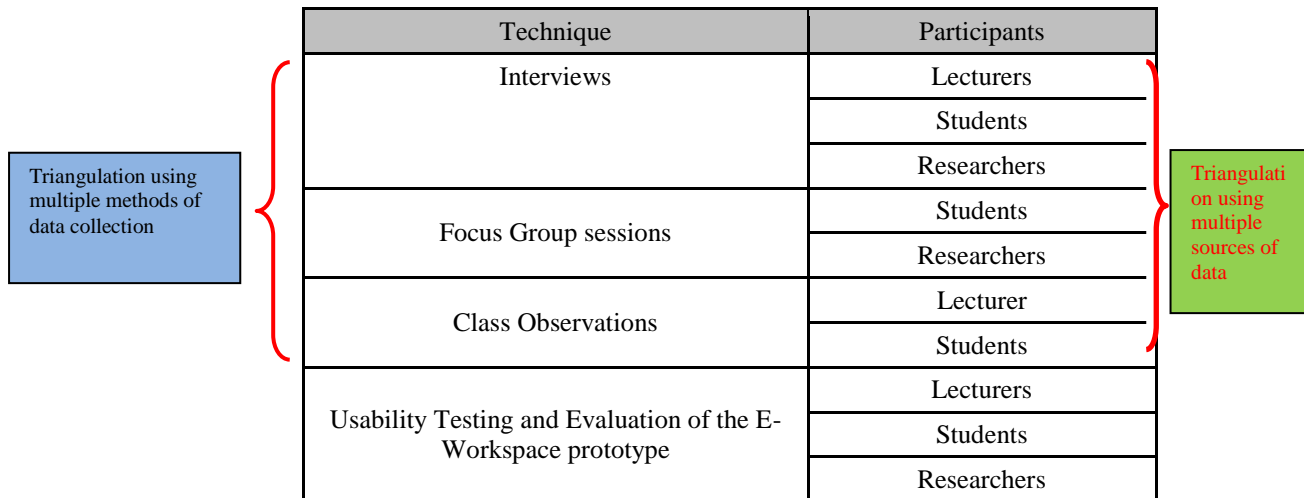


Figure 3.11: The Triangulation Techniques That Applied In the Data Collection of the Study

Triangulation is not aimed merely at validation but at deepening and widening one's understanding (Olsen, 2004). Data triangulation is often thought to help in validating the claims that might arise from an initial pilot study. In this study, the triangulation technique is also applied to the validation of the instruments and the validation of data. Validation of instruments refers to the action to validate the research instrument; interview questions and focus group questions and observation plan by conducting the pre test/pilot testing. Validation of data refers to the action to validate the data collected obtained from interview, focus group and observations by sending out the interview and focus group transcripts and the observation field noted to the participants and asked for their conformity on the data that they had given. These two validation steps applied during the data collection process and during the usability testing.

3.7 Summary

As a summary, this chapter reports on research design and methodology that were used when conducting the research work in order to meet its main objective, which was to investigate the needs of paleographers and to model a collaborative digital workspace for Malay manuscripts community. This study employed Soft Systems Methodology (SSM) to seek answer to the research questions using qualitative case study by means of interview, focus group and observation. The rest of the chapter discusses on data collection methods and procedures including instrument development, data analysis techniques, and reliability and validity of the data through triangulation techniques. The following chapter discusses on details about the first and second phases of SSM in order to unmask the problem situation of manuscript studies community.

CHAPTER 4

UNMASKING THE PROBLEM SITUATION: PHASE 1 AND PHASE 2

4.1 Overview

This chapter discusses on the first and second phase of the research work in order to investigate the issue and challenges that paleographers (students, lecturers and researchers) faced in Malay manuscript studies. This is done through interview, focus group and observation sessions conducted at the APM, UM. The data was analyses in various sections to fulfill the requirements of Stage 1 and 2 for SSM. The data analysis process seeks to discover the problem situation, which contributes to the development and presentation of a complete rich picture that represents the problem situation and reflecting the main entities involved. The elements of the processes depicted in a rich picture indicated their inter-relationship of situation being investigated. In addition, the second phase discusses on the root definition and CATWOE analysis which represents Stage 3 of SSM.

4.2 Academy of Malay Studies (APM), University of Malaya (UM)

The research approach is a case study, which allows the researcher to explore an activity or a process undertaken by one or more individuals in detail. The case(s) are bounded by time and activity, and the researcher collects detailed information using a variety of data collection procedures over a specified period of time (Cresswell, 2003). This method appears to be suitable in situations where the case instances are small and focused, as reflected by the very small number of institutions of higher learning offering manuscript studies as part of the philological course in Malaysia. In University of Malaya, there are

three faculties that offer philological related courses, namely, Academy of Malay Studies (Akademi, 2008), Academy of Islamic Studies and Faculty of Art and Social Sciences. Other universities that offer manuscript studies are The National University of Malaysia (UKM), Putra University, Malaysia (UPM) and Sultan Idris Education University (UPSI). This study focuses on Academy of Malay Studies (APM), University of Malaya (UM), which is directly involved in teaching, learning and researching Malay manuscripts. The decision is made based on convenience as the faculty members and students involved are nearby the vicinity of researcher's own faculty. This proximity is expected to facilitate interviews and meetings with academic staff and students.

This stage depicts the processes and problems identified from the interview, focus group and observation sessions in a rich picture. The findings from the three data collection approaches are extracted and collated according to three types of stakeholders: (i) lecturers with higher knowledge and expertise on Malay manuscripts, who are responsible for handling and teaching Malay manuscript studies, (ii) students with a basic level of knowledge on Malay manuscripts, who are currently enrolled in the course or have undergone an introductory course on Malay Philology and (iii) researchers who are researching Malay manuscripts and are registered for Master and PhD programme. The findings from this study encompasses merging data from the coding process, which involves extracting text data, segmenting sentences (or paragraphs) into categories, and labeling those categories with terms, often a term in the actual language of the participant. This process is recommended by Cresswell (2003) in order to break responses into themes. The description aims to highlight the processes of teaching and learning Malay manuscripts presently practiced, the supporting resources available and the use of technologies in the teaching and learning process.

4.3 Phase 1: Finding Out About the Problem Situation

The objectives of Phase 1 for the focus group are presented in Figure 4.1:

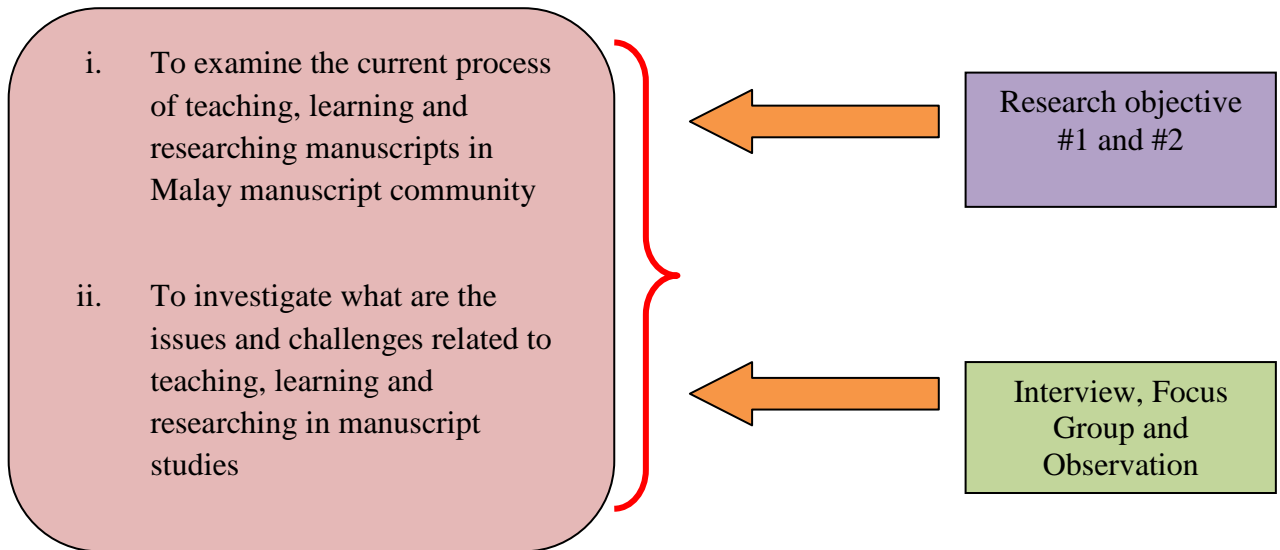


Figure 4.1: Objectives of Phase 1

4.3.1 Interviews

The interview sessions were conducted with lecturers who have taught courses related to Malay manuscripts, students who enrolled in Malay manuscript courses and researchers who were doing research on Malay manuscripts. The main purpose was to investigate the current processes involved in teaching, learning and researching manuscript studies and to unveil issues and challenges related to it.

4.3.1.1 Lecturers

The interviews were focused on lecturers with experience handling manuscripts and those who have taught Malay manuscript studies. In APM, the course that directly involves the use of Malay manuscript is “Introduction to Philology”. Data is collected through a series of interviews with four APM lecturers. Each lecturer was interviewed at least once, and each interview last approximately one and a half hour. The interviews are conducted in the lecturers’ rooms. Although the series of questions guide the discussion, each interview has a life of its own, and the conversation is a fluid, friendly exchange between peers. Before the interview, the researcher obtained brief information on the lecturer, the lecturer’s teaching background as well as experience in Malay manuscript studies. This is to enforce a basic understanding of the lecturer’s personality and instructional methods. The interview summary sheet (see Appendix B) is reviewed after each interview as the researcher identifies general themes amidst the wide range of responses. Short summaries of the interviews are sent to each participant to verify what has transpired. The lecturers return the summaries with clarifying information that is extremely helpful.

This case study focuses on the perspectives of four lecturers with experience teaching “Introduction to Philology” course, and conducting research in Malay manuscripts. Due to the nature of the research design, the sample is relatively small and not randomly selected, and therefore cannot be generalized to the entire Malay manuscript teaching and learning community. However, it is very important that the study is representative of the population of interest in the selected faculty site. A special effort is made to search for lecturers in different departments in APM, in order to observe differences in their experience and opinions on Malay manuscripts studies. APM suggests five names, which are considered to

fit the criteria of a participant and hence suitable for this study. However, one lecturer is presently away on sabbatical leave and therefore could not be interviewed. After finalizing the nomination list, a letter explaining the nature of the study and an invitation to participate is sent to each potential participant (see Appendix C). The lecturers are interviewed (pseudonyms are used for all names throughout this work) and their demographic information is presented in Table 4.1.

Table 4.1: Demographic Information of Lecturers

Gender and Age	Lecturer (Pseudonym)	Years of Teaching Experience	Highest Academic Degree	Computer Access and Usage	Designation
60(M)	L1	25	Ph.D	Home, computer office and own laptop	Associate Professor
67 (M)	L2	43	Ph.D	computer office and own laptop	Professor
54(M)	L3	26	Ph.D	computer office and own laptop	Associate Professor
56(M)	L4	10	Ph.D	Home and own laptop	Professor

Each participant is involved in Malay manuscript teaching and research for at least 10 years, and owns a computer or has one at home. The lecturers report using the computer for professional work, whereby the computer is mostly used for Internet browsing and emailing. However, they are not frequent computer users in terms of word processing, creating spreadsheets and slideshows. One of the lecturers claims that they are able to perform daily activities without computers even though they are each given a desktop computer or laptop by the faculty. One of the factors that contribute to the seldom usage of computers is that the lecturers have started teaching since the 1980s and 1990s, whereby computers and Internet were considered new technologies at the time. However, when they

are questioned on the benefits of ICT, the lecturers are all aware and can accept the existence of computers and Internet as a medium for teaching and learning. In general, the lecturers exhibit similarities in their attitude and opinion on the value of Internet as a teaching and learning tool and teacher-directed student use, regardless of their ICT skills.

Although the case study was focused on a very small group of lecturers, some very interesting themes have emerged. Thematic analysis (Lacey & Luff, 2009) is used to create categories which capture the nature of the participants' stories. The findings for the lecturers are organized into the following themes:

- (a) Process of teaching and learning from the lecturer's perspective
- (b) Current problems faced by lecturers
- (c) Lecturer's viewpoint on the initiatives to preserve Malay manuscripts
- (d) Lecturer's awareness towards electronic environment of Malay manuscripts

The following results are structured around the themes that emerged from the interviews, along with supporting data.

- (a) Process of teaching and learning from lecturer's perspective

The students from APM were offered two courses which were closely related with Malay manuscript studies, namely, "Introduction to Philology" (*"Pengantar Filologi"*) and "Research on *Jawi* Script" (*"Kajian Tulisan Jawi"*). However, Research on *Jawi* Script" is no longer offered due to time constraints. The main process in learning Malay manuscripts was transliteration. Transliteration refers to mapping from one system of writing into another, word by word, or ideally letter by letter (Wikipedia). In this course, students were required to transliterate old *Jawi* scripts into Romanized Malay without altering the

pronunciation of the words. There were three methods which can be used to study Malay manuscripts, namely, transliteration, annotation and transcription. However, the decision to choose which method was made by the students as some students prefer to study manuscripts using their own style. *“Firstly, students need to do the transliteration process, followed by analysis. It is vital that transliteration is performed correctly because the analysis will be wrong if the transliteration is wrong. I will usually ask them to consult the librarians in the National Library to assist them during the transliteration process”*. L1 said.

Students were given a group assignment which requires transliteration, analysis and research of the manuscript’s author. In teaching Malay manuscripts, L2 commented, *“Basically, I will begin with the background of the manuscript. As an example, I will provide a manuscript on “Pengaruh Inggeris dan Belanda di Nusantara” (The Influence of British and Portugese in Archipelago), and students need to research who is the author, what are the results and what has been carried out. Research on the activities by the author are also included, as well as research on Philologists”*. Besides reference books, students also used Classical Malay dictionaries to help them in assignments involving transliteration works. They also have to discuss and seek advice from lecturers and experts in the area.

Most of the lecturers have many years of research experience in Malay manuscript studies. A key criterion in studying Malay manuscripts is that one needs to understand *Jawi*. *“In my case, I have an advantage because I am a Malay linguist. I know Jawi ever since I was young, and therefore I can understand the contents and semantics. For me, Malay manuscripts are easy to understand”*, said L1. L2 added, *“Before attending my class, most of the students have knowledge on Jawi. If there are students without knowledge of Jawi,*

they can go for other alternatives by doing other assignments, such as researching the manuscript's author and referring to the transliterated versions of manuscripts". The lecturers profess that it is not University's obligation to teach students how to read *Jawi*.

(b) Current Problems Faced by Lecturers

One of the problems in Malay manuscripts studies is lack of time. The duration for one semester is 14 weeks, which is insufficient to deliver the entire syllabus of the course to students. L2 said, *"We are given 14 weeks in each semester to teach and deliver the course contents. It is difficult"*. Students usually take initiatives to discuss at other times besides lectures.

There are presently a limited number of philologists in APM to whom students can seek for advice. According to L1, philologists are rarely found nowadays. *"I can say that, there are no philologists in APM. We only have the experts for the contents of manuscripts, but not philologists. For example, my PhD was devoted on research on manuscripts, and I did research on manuscripts. Firstly, as a philologist, they need to know how to read the text, analyze the contents, as well as the physical text of the manuscripts. In APM, most people have no knowledge on physical texts, watermarks, writing font as well as the type of paper being used"*.

In addition, students face problems in searching for Malay manuscripts, particularly those that have been utilized by other students. There is a lack of Malay manuscript resources available. In order to rectify this problem, the lecturers have no choice but to allow students to utilize the printed or edited versions of Malay manuscripts, which indicates that the students work on the works of others. *"The main problem is the manuscript sources.*

Students complain that it is difficult to find a manuscript to work with. This year, all manuscript collections are compiled in API (Academy of Islamic Studies). However, students still complain that the place is not easily accessible, with a small collection of manuscripts. To solve this problem, I simply allow them to use the printed versions of manuscripts”, said L2. The printed version of manuscripts refers to original manuscripts that are copied and printed in books or papers. This poses a problem as printed versions may result in overlapping of transliteration works as students and/or lecturers may not be aware whether the manuscripts have been transliterated previously.

Problems also occur for non-Malay students, without an understanding of *Jawi*. It is not the University’s obligation to teach *Jawi*. Preservation of old manuscripts requires initiative and budget. In University of Malaya, there is currently no ‘special’ place to store original manuscripts. Manuscripts need to be stored in a room with a suitable temperature. Furthermore, people should not enter the room without wearing protective masks and gloves in order to preserve the old and fragile manuscripts. Most people are unaware of the regulations associated with preservation of manuscripts. There are regulations on this matter but most people are unaware of it. L1 said, *“I am from the Department of Languages, and yet I have never seen any initiative from the Department of Arts, which is primarily responsible for protecting the manuscripts. At present, my team and I show more interest in protecting the manuscripts”*. L1 added, *“The collections have been relocated to the main library, but nobody is responsible for preserving them. I can build a specialized room for the manuscripts, but it requires a budget of less than RM100, 000”*.

L1 perceives that the manuscripts from the nation should be kept at their original locations. It is deemed unnecessary for the collections to be compiled in one place. *“One lecturer*

here requested me to put all our manuscripts in the National Library, but I disagreed. We have to protect our own collection and we can't simply give people whatever we have. People will simply take advantage of what we have". Manuscripts sharing are also compounding issues with regards to protection rights of manuscripts. Some of the lecturers believe that they must protect the collections in order to prevent other people to 'steal' them.

(c) Lecturer's Viewpoint on the Initiatives to Protect Malay Manuscripts

Institut Alam dan Tamadun Melayu, (ATMA) , UKM, forms the initiative to develop a Web repository to gather Malay arts and classical heritage. This initiative is collaboration between all experts, researchers and those people who are interested in Malay culture and traditions. There is also a society in APM that is responsible for promoting Malay manuscripts and literature, with plans for preserving old manuscripts. These lecturers preserve the manuscripts by making microfilms and digitizing manuscripts out of their own initiative. L3 said, "There is a manuscript unit in APM, however it is inactive. I believed that it is very helpful if they have initiative to do similar works as the Digital Library of Malay Manuscripts. For now, I have documented 40 manuscripts in microfilm and I digitize them and one of them is manuscripts of the Friday sermon".

(d) Lecturer's Awareness towards electronic environment of Malay Manuscripts

Electronic environment of Malay manuscript system is believed to be the best Malay manuscript resource in the future. Students will no longer face problems in searching for manuscripts, which will greatly facilitate them to produce quality assignments in a timely manner. Discussions and communication with lecturers as well as course mates will be easier. The system will also promote Malay manuscripts to general public and younger

generations. However, there are opposing views regarding the system, as electronic environment is deemed to cause laziness and it is inadequate to become a philologist by merely learning electronically. Several respondents are uncomfortable when the manuscripts are available on the Internet and they have disputes regarding the manuscripts and legality of making the manuscripts available on the Web. The respondents also provide views on the modules that should be incorporated the E-workspace system. L1 suggests that cataloguing tools should be present and remarked. *“A new researcher usually goes to the National Library and searches for a catalogue. Each place that stores the manuscripts must have a catalogue. Unfortunately, we do not have catalogue in UM, and am still discussing with my colleagues regarding this matter”*. It is concluded that the proposed modules should consist of transliteration tools, Malay manuscript dictionaries and discussion tools. Several respondents display a positive response on the initiative of Malay manuscript E-workspace. L2 commented, *“The digitized version of manuscripts can be used as a main source for my students to do assignments. Is it possible to compile their works (transliterated versions) in the E-Workspace system in the future?”* He recommends that a feature should be made available to upload the transliterated versions of manuscripts performed by his students, as a reference to the original digitized manuscripts. L4 proposes that *Jawi-Malay* auto translation tool should be provided and said *“There is a group in FTSM which develops an auto transliteration system from Jawi to Romanized Malay. However, they fail to achieve their target. If you can do such a thing, it is definitely a breakthrough”*. However, there is one respondent who disagrees with the E-workspace initiative and said, *“I think this kind of system makes people lazy. Philologists are supposed to know the physical criteria of the manuscripts. They have to touch and feel them and not only see them on the screen. Additionally, we will never know whether all information in the system is correct or otherwise”*, said L1.

In summary, the findings indicate a general pattern of tendencies with regards to the lecturers' experience in teaching and handling Malay manuscripts. The findings are inapplicable to all lecturers who teach Malay manuscript courses, and pertain only to the domain of APM.

4.3.1.2 Students

According to the Academy of Malay Studies Handbook (2008/2009), "Introductory to Philology" is a core course for students to enroll in the Department of Malay Literature of the academy. At the end of the course, students are expected to be able to explain the concept of philology, discuss works created by local philologists in the Malay archipelago and Europe, as well as able to assess and examine philologists' works related to Malay manuscripts and apply the knowledge of philology to study Malay manuscripts that they have chosen as their study text for the course. In addition, students are expected to be able to read, understand and analyze the old *Jawi* scripts used in a majority of Malay manuscripts. Students are also expected to transliterate (from old *Jawi* to *Romanized* Malay) and translate (from old *Romanized* Malay to modern Malay) different manuscript versions and add their works as future references for users. Interview sessions are also conducted with students who undertake research on Malay manuscripts at the Master's level.

Table 4.2 shows the demographic information of students from the interview sessions. The names of the students who participated in this interview were suggested by the lecturers who were previously interviewed. They were students attending the "Introduction to

Philology” course as well as students who have attended the course in the previous semester. One of the participants has been involved in Malay manuscript learning since secondary school. The participant’s father has his own collection of Malay manuscripts inherited from elder generations.

Table 4.2: Demographic Information of Students from the Interview Sessions

Gender and Age	Students (pseudonym)	Year of Study	Highest Academic Degree	Computer Access and Usage	Years of experience in Handling Malay Manuscripts
22(F)	S1-I	2	Bachelor’s Degree	Home, computer lab and own laptop	7
23(F)	S2-I	2	Bachelor’s Degree	Home and computer lab	3
25(M)	S3-I	4	Master’s Degree	Home, computer lab and own laptop	5

The participant has been educated to read *Jawi* scripts since kindergarten. Two other participants are involved in learning Malay manuscripts since they are registered in APM. However, both participants know how to read *Jawi* since primary school. The participants are frequent users of the Internet, and claim that they spend 3-5 hours a day on the Internet especially for browsing and social networking. They have computers and Internet facilities at home, as well as in the faculty’s computer laboratory. Two participants possess their own laptops. Computers are also used for word processing, creating spreadsheets and slideshows. The assignments are prepared using computers and submitted to their lecturers in soft and hard copies.

They are unaware on the existence of Digital Library for Malay manuscripts, but they are aware on the benefits of ICT usage and report that their day is incomplete without

computers. They do not face problems in learning to use new Web-based systems and are willing to learn a new system on their own.

Thematic analysis (Lacey & Luff, 2009) is employed to create categories that capture the nature of the participants' stories, similar to the procedure carried out for the lecturers' interviews. The findings are organized into the following themes:

- (a) Learning process in class
- (b) Current problems
- (c) ICT awareness
- (d) Motivations on preserving Malay manuscripts

The following results are structured around the themes that emerged from the interviews, along with supporting data.

(a) Learning Process in Class

“Introduction to Philology” class is carried out three hours per week in duration of 14 weeks. Besides the two-hour lectures, students are also required to attend tutorial classes. Tutorial classes facilitate the students to complete the assignments given. “There are three hours of “Pengantar Filologi” class per week. Two hours are for lectures, whereas one hour is allocated for tutorial session” S1-I said. This course accommodates about 60-90 students each year, and the student are divided. S1-I added, *“There is a huge number of students during lectures. When I attended the course last time, there were roughly 60 students in the lecture hall. The lecturer usually tells stories and histories of famous figures in the Malay manuscript community, whereas the tutorial session focuses on assignments”*.

The teaching process is often a one-way basis, especially during lectures. *“The lecturer simply uses the white board marker to explain what he wants to teach us, and we have to quickly jot down all important facts”*, revealed S2-I. Computer and Internet facilities are unavailable during tutorial sessions. The lecturers are more comfortable teaching by using the chalk-and-talk approach.

Transliteration is a compulsory process before analyzing a manuscript. Even though most students are able to read *Jawi*, the manuscripts are sometimes difficult to read and comprehend due to old font and language. *“We need to transliterate a chapter from a novel. My group mate obtained the manuscripts from his father’s collection and fortunately the Professor approved them for our assignment”*, said S3-I.

(b) Current Problems

Besides lecturers, there are no other experts that the students can refer to if they face difficulties with their assignments. The time allocated during tutorial sessions need to be used wisely. Otherwise, the students need to arrange a different meeting with the lecturer. *“The transliteration process is 100% carried out on our own. It is really tough to meet the lecturer in person. We manage to meet him only during tutorial sessions and the students usually have to queue in order to ask questions at the end of class”*, said S2-I. Students are given the opportunity to discuss with the lecturer and other group members during tutorial sessions.

Malay manuscripts can be defined as a handwritten old text in *Jawi* script, whereby most of the collection can be easily found as printed versions. *“Searching for manuscripts is a big*

problem for my group. We manage to get approval only after showing the third manuscript to the Professor” said S3-I.

(c) ICT Awareness

The students are IT literates and frequent users of the computer and Internet. However, the lecturers still prefer students to submit their assignments in hard copy. *“We do our assignments using computers and word processors, but we submit to the Professor in hard copy. That is his requirement”*, commented S1-I.

Similar to other faculties in UM, APM is also granted ICT facilities such as computers, projectors and printers in order to support the students’ learning process. However, the lecturers are more comfortable using the chalk-and-talk approach. According to S2-I, *“Presentation is conducted orally, because we do not have any projectors and computers during tutorial sessions”*.

(d) Motivations on Preserving Malay Manuscripts

The students agree to promote Malay manuscript studies to the younger generation. *“I suggest that the younger generation should take part in learning Malay manuscripts. I have learnt a lot about the earlier generations”*, said S2-I. S2-I added that, *“It is our responsibility to preserve the Malay manuscripts and disseminate knowledge to the future generation”*.

S3-I recommends that “Pengantar Filologi” class should be opened to students from other faculties. *“It is a good idea if other faculties can join this class as an optional class, such*

as for ko-q”, said S3-I. The results from this analysis will be combined with the focus group results.

4.3.1.2 Researchers

The interviews are focused on researchers who are currently carrying out research in Malay manuscript studies. The names of respondents are suggested by the lecturers who have participated during the interview sessions. The researchers are supervised by these lecturers and the lecturers claim that the researchers can give good responses as they have wide knowledge in Malay manuscript studies. After finalizing the nomination list, a letter explaining the nature of the study and an invitation to participate is sent to each potential participant. The data is collected through a series of interviews with two researchers. Each participant is interviewed at least once, and each interview lasts approximately one and a half hour. The interviews are carried out at APM. Both researchers are currently undertaking their PhD research in Malay manuscripts. However, one researcher has just embarked on PhD research, whereas the other is near completion. The interview begins with a brief description of both the interviewer and participant. This is important to establish rapport, which ensures that interviewer and participant do not feel awkward during the interview session.

The interview summary sheet (see **Appendix B**) is reviewed after each interview as the interviewer identifies the general themes from the wide range of responses. After compiling the transcription of the interviews, short summaries of these interviews are sent to each

participant to verify what has transpired. The researchers return the summaries with approval and good response.

The result of the researchers interviewed (pseudonyms are used for all names throughout this thesis), and their demographic information are presented in Table 4.3.

Table 4.3: Demographic Information of Researchers from the Interview Sessions

Gender and Age	Students (pseudonym)	Year of Study	Highest Academic Degree	Computer Access and Usage	Years Of Experience in Handling Malay Manuscripts
25(F)	R1-I	1	Master's degree	Home, computer laboratory and own laptop	4
35(M)	R2-I	4	Master's degree	Computer laboratory	10

Four themes are identified following the analysis of data. The themes are listed as follows:

- (a) Lack of references to refer to
- (b) Unaware of the existence of digital resources for Malay manuscripts
- (c) Require dictionaries to support transliteration work
- (d) Difficulties to find philology experts to refer to and collaborate with

The following results section is structured around the themes that emerged from the interviews, along with data explaining them in greater detail.

- (a) Lack of References to Refer to

References refer to documented references such as dictionaries, theses and journal articles. According to the researchers, reference books for Malay manuscripts studies are not as abundant as those in Science, Architecture or Computing. Besides library, the researchers borrow books and theses from lecturers in the faculty. *“Yes, the collection of theses from*

other researchers is very important for my research resources. I always obtain them from the faculty library or directly from thesis owners” said R1-I.

(b) Unaware on the Existence of Digital Resources for Malay Manuscripts

This situation also occurs during the interview sessions with lecturers and students as they are unaware on the existence of digital resources for Malay manuscripts. *“I have never heard about online resources on manuscript collection before. All this while, I use research materials such as books and theses that are available in libraries” (R2-I).* The researchers believe that the Digital Library of Malay manuscript system is not fully promoted. They believe that it is crucial to increase awareness on the system especially amongst the Malay manuscript community.

(c) Require Dictionaries to Support Transliteration Work

The main process involved in understanding Malay manuscripts is through the transliteration process prior to the analysis process. *“Transliteration is the most important process whereby the researcher needs to convert old Jawi script in Romanized Malay. It is very important that the researcher knows how to read Jawi script” (R1-I).* According to the researchers, all other researchers carrying out research in Malay manuscripts know *Jawi* even though they are not Malays or Muslims.

In the transliteration process, the researchers report that the most important reference is dictionary. *“From my own experience, I use dictionaries to assist me in transliteration. There are quite a number of dictionaries in the market, but so far I think “Kamus Melayu Klasik” is the best dictionary for Malay manuscript studies. It will be very helpful if this*

dictionary can be digitized, “said R1-I. It is proposed that an online classical Malay dictionary will be very helpful in research.

The usage of ICT amongst the Malay manuscript community is still very low especially among elders. *“I seldom use PC in my daily research. I just use it for writing, as most of the research sources are in hard copy. I believe that all researchers in manuscript studies perform research in the same manner,”* Remarked R1-I. They feel comfortable working with the hard copy of manuscripts compared with viewing them via a computer screen.

(d) Difficulties to Find Philology Experts to Refer to and Collaborate With

Malay manuscript experts can be found in various locations worldwide. The researchers informed that there are a number of experts in Malay manuscript research in England and Holland, and manuscript collections are attainable there. In Malaysia, most of the experts are from the older generation and some are retirees. *“I always keep myself in touch with the experts in my research area from other universities in order to keep myself updated and to obtain information related to my research”* said R1-I.

4.3.2 Focus Group

Focus groups were conducted as one of the data collection method for this study. The interviews that were reported earlier focused on data pertaining to an individual’s experience in the teaching and learning process for Malay manuscripts, particularly lecturers, students and researchers. The focus group, however, focused more on the students ‘experience during the learning process of Malay manuscripts and researchers’ experience during the research on Malay manuscripts.

A set of questions is prepared for data collection. According to Elliot (2005), focus groups can reveal a wealth of detailed information and deep insight. A focus group creates an accepting environment that puts participants at ease, allowing them to thoughtfully answer questions in their own words and add meaning to their answers when it is well-executed. Unlike individual interviews, members of a focus group provide their personal answers, which may result in the possibility of giving fake answers.

4.3.2.1 Students

Focus group discussions are conducted with eight APM students at three different sessions. Three different sessions are applied with the same participants and with the same questions set in order to get the constant data set. The participants comprise of students who have attended Philology course (a course that uses Malay manuscripts) in APM. The students interviewed represent a broad range of experience in using Malay manuscripts, how they handle them, when they use them, and the problems faced during their study. The participants nominated for the group are provided by a student who has been interviewed previously during the first stage of data collection. Pseudonyms are used for all eight names throughout the focus group discussions (S1-FG, S2-FG, S3-FG, S4-FG, S5-FG, S6-FG, S7-FG and S8-FG).

The duration of each focus group discussion is between 1 hour and 15 minutes and 2 hours. The participants represent a range of different educational and family backgrounds. In this study, all references to individuals are deleted in order to maintain confidentiality of the participants. The questions in the focus group range from basic information of each participant's background to how they conduct Malay manuscript studies as well as their

recommendations for improvement. The list of questions is presented above section. The complete range of questions and answers follows the introduction and summary section. The broad themes, along with the major and minor categories of the students' answers are summarized.

Elliot (2005) added that *“If you have ever participated in a well-run focus group, you would probably say it feels very natural and comfortable to discuss with a group of strangers”*. It can be deduced that focus group is less formal compared with interviews, which enables participants to feel relaxed when giving their responses. Hence, it is expected that the participants will give accurate and honest answers in a well-executed focus group.

From the demographic survey results among students, it can be observed that participants have experienced in learning Malay manuscripts for less than three years. The participants enroll in the course during the second semester of session 2008/2009. They have formal practice of learning Malay manuscripts in the university; they are females aged between 21-23 years old. A majority of the participants major in literature (6 students) while others major in language (2 students). Their parents' occupations range from farming (4 students), to business (2 students) while some are government servants (2 students). Most of the participants hometowns are located in North Peninsular Malaysia (6 students) while the remaining participants hail from East Peninsular Malaysia (2 students).

The results indicate that the students have different backgrounds. The participants are within a similar age group due to the fact that they are selected from the same “Introduction to Philology” class.

There are several types of Malay manuscripts that students choose for their assignments. According to the participants, there are three generations of Malay manuscripts. The Malay manuscripts that they are commonly used for their assignments are taken from the latest generation. This means that the manuscripts are ‘readable’ *Jawi* and are relatively easy to transliterate compared to the first and second generations of Malay manuscripts. However, the Malay manuscripts in the Digital Library currently consist of the first and second generation manuscripts. It has been mentioned in Chapter 1 that electronic workspace system will solely use the Digital Library Malay manuscript collection as the primary source for students’ assignments. A number of students perceive that they are not at the level to work with ancient manuscripts within a duration of only one semester. As amateurs, the students are advised to begin with simple comprehensive Malay manuscripts. The key issue here is how to ensure that the Malay Manuscript Digital Library will remain as the primary Malay manuscript resource. The following conclusions are drawn from the focus group discussions:

- a) A list of learning objectives should be presented at the beginning of the class, which will make the class to be more manageable.
- b) Lecture materials should be presented prior to each class.
- c) Classes should be carried out in a two-way communication (between lecturers and students)
- d) Malay manuscript courses should be offered to all students in the university.

A discussion of each theme pertaining to the students’ experience on handling Malay manuscripts is presented below:

(a) Context used in Malay Manuscript Studies

The focus group discussions reveal that the context used in “Introduction to Philology” class when learning Malay manuscripts is the type of language used in each Malay manuscript and writing style. Writing style is related to the font type and the manner in which the content in each manuscript is delivered. Another context used in learning Malay manuscripts is the author. S1-FG remarked that *“The context of learning Malay manuscripts in Pengantar Filologi class basically consists of four research areas. The first one is focused on the author, manuscript’s title, type of manuscript and the way we do transliteration. If we do research on the authors, we are going to research about the author’s background, who they are, what they are writing, the contents of the manuscripts, when the manuscripts were produced, as well as the manuscripts’ font. For example, what is the kind of ink that they used.”* There is an unlimited area of research for manuscript studies. However, it can be concluded that the key research areas in “Pengantar Filologi” course are related to authors and manuscript writing.

(b) Users of Malay Manuscript Studies

According to the participants, the current users of Malay manuscripts in Academy of Malay Studies are the students who have taken the “Pengantar Filologi” course. Furthermore, the users of Malay manuscripts are researchers and lecturers who are carrying out research in Malay manuscript studies. *“In APM, the only course that uses Malay manuscripts as the primary source is Pengantar Filologi. Other people involved in using Malay manuscripts are Dr. Norhayati and Dr. Zahir because they are very interested in Malay manuscript research and they attained their Master’s degree in Malay manuscript studies”*, said S2-FG.

(c) Malay Manuscript Usage

The students all agree that most of the students in their class utilize Malay manuscripts only during the class and for class purposes. S1-FG said, *“All of us are almost the same; as we merely use Malay manuscripts during the class”*. S3-FG agreed, saying *“Personally, I use the manuscripts only during lectures and when I am given assignments in Pengantar Filologi course”*. However, the usage of Malay manuscripts is dependent on one’s own interests. S2-FG comments that there are lecturer are very interested in Malay manuscript research. *“Dr. Razak, for example, loves Malay manuscripts so much and always goes abroad to research Malay manuscripts”*.

(d) Motivations for Using Malay Manuscript

It can be deduced that most participants are motivated in Malay manuscript studies from their own self-interests. The assignments function to increase their awareness on the importance of Malay manuscript studies. S6-FG said, *“When I am scouting for university degree courses, Malay studies is my first choice. When I was in secondary school, my teacher suggested that I should choose Malay studies for my tertiary degree and now I discovered that I am really interested in it”*. The other participants said that they started to develop interest in Malay manuscript studies when they are given assignments during the Pengantar Filologi course. *“In the course, we are taught on the definition of philology, the latest developments on about manuscripts, authors and the manuscripts that have been produced,”* said S5-FG.

(e) Problems Faced When Using Malay Manuscripts

When students are questioned on the problems that they faced while handling Malay manuscripts, the first arising problem is the lack of Malay manuscript resources. Most of

the students use modern Malay manuscripts rather than those from the first generation. *“Usually, the first place to search a manuscript is the main library. Researchers like us normally conduct research on manuscripts that have been simplified by other authors such as novels. This is because the original Malay manuscripts are very fragile and hard to obtain due to their age and value”,* said S7-FG. Another problem faced is the transliteration process of the manuscripts. *“Personally, I have problem with transliteration. I chose an old Malay manuscript with old Jawi script for an assignment and the script contains no guidelines at all, which made it really hard to read”,* added S1-FG.

(f) Process of Malay Manuscript Studies

In this course, the process of completing an assignment can be considered as completion of the learning process of a Malay manuscript. The first step involved in an assignment is searching for a Malay manuscript. The students are required to search for manuscripts on their own, whereby some obtain manuscripts from the library, while others search from the public library and their family’s personal collections. S8-FG remarked, *“For me, I have a huge collection of old manuscripts in my house. For my assignment, I chose a manuscript “Pedoman Sembahyang Berjemaah”. I asked my lecturer for approval, and when he agreed with the manuscript, I started to do the assignment. It took approximately three weeks to do the transliteration process, and upon completion, we combined it together and prepare ourselves for the next process”.* Following the transliteration process, the students will consult the lecturer regarding the assignment and feedback. *“The lecturer will give comments on the contents that should be added into the assignment. For example, if we are researching on the value of love, we need to find the aspect of love in the manuscript. However, this still depends on the type of manuscript. In my case, I chose a manuscript*

related with art, and therefore my lecturer advised me to do research focusing on value, role and background”, said S3-FG.

(g) Improvements of Malay Manuscript Studies

The students provide many comments and ideas on improving the course based on their experience. The ideas can be summarized into three aspects, as follows:

- i. Age of manuscripts: S4-FG feels that it will be a great challenge if students are given the opportunity to work on ancient manuscript collections. *“The manuscripts that we are currently working on are among the latest collection of manuscripts. This is because the new manuscripts, as they are easier to understand and transliterated. I think that the Professor should give us a chance to work on old manuscripts. I think that there will be no problems as long as we show interest towards this study”.*
- ii. Knowledge of Malay manuscripts: Most of the students remark that knowledge on Malay manuscripts is limited for the students who have just enrolled in the course. *“We have no knowledge on Philology before we join the class, and we heard about it from the Professor”, said S8-FG.*
- iii. Lecturer’s experience: A majority of the students feel that it is better if the lecturer can prepare a course outline that explains the details on the activities that will be performed throughout the semester. *“No, all the things that he delivers to us are from his own experience. He said that at our level of study, we cannot expect to be spoon-fed and we need to be more independent”, said S1-FG.*

In summary, the findings of the current study indicate a general pattern with regards to the students’ work process when they are carrying out their assignments.

4.3.2.2 Researchers

Focus group discussions are conducted with eight APM postgraduate students at three different sessions. The participants comprise of postgraduate students who are conducting research in Master's and doctoral level in APM. From the focus group sessions, they represented a broad range of experience in using Malay manuscripts, how they handle them, when they use them, and the problems faced during their research. The participants nominated for the group are provided by lecturers in APM who are their research supervisors or group leader in their research group. Pseudonyms are used for all eight names throughout the focus group discussions (R1-FG, R2-FG, R3-FG, R4-FG, R5-FG, R6-FG, R7-FG and R8-FG).

The duration of each focus group discussion is between 45 minutes and 2 hours 30 minutes. The participants represent a range of different educational and family backgrounds. In this study, all references to individuals are deleted in order to maintain confidentiality of the participants. The questions in these sessions are the same with the questions that being asked to students in focus group sessions, but when the discussions were getting deeper the questions asked were different which is focusing on the research process. The questions being asked are from basic information of each participant's background to how they conduct Malay manuscript research as well as their recommendations for improvement. The broad themes, along with the major and minor categories of the researchers' answers are summarized.

The focus group session started with the demographic questions that being asked via a hard copy form. The participants are required to answer nine demographic questions. From the results, it can be observed that all participants have experienced in learning Malay

manuscripts for more than eight years. Two of the participants had no experience attending course that related to Malay manuscripts study, while the other six participants had enrolled in the course. They have formal practice of learning Malay manuscripts in the university; they are 5 males and 3 females aged 24 years old and above. A majority of the participants major in literature (6 students) while others major in art (1 student) and language (1 student). Their parents' occupations range from farming (1 student), to business (2 students) while some are government servants (5 students). Most of the participants hometowns are located in North Peninsular Malaysia (4 students) while the remaining participants hail from East Peninsular Malaysia (2 students) and South Peninsular Malaysia (2 students).

When conducting research, all participants have their own research scope of Malay manuscripts research. Some of them doing research that are related with the art of Malay manuscripts that requires them to explore on writing styles, font and type of language that being used in a particular manuscript. While some of them doing research on the author of manuscripts and the rest of them doing research on the content of manuscripts. A number of researchers had experience collecting data in other country like Indonesia that also owns Malay manuscript collections but most of the collections need to be paid in order to access them.

Four themes are identified following the analysis of data. The themes are listed as follows:

- (a) Lack of references to refer to
- (b) Unaware of the existence of digital resources for Malay manuscripts
- (c) Current Practice of Manuscript Research Activity
- (d) Difficulties to find philology experts to refer to and collaborate with

The following results section is structured around the themes that emerged from the focus group sessions, along with data explaining them in greater detail.

(a) Lack of References to Refer to

Beside reference books, they also refer to theses as their main research resource, as indicated by R5-FG, *“Yes, the collection of theses from other researchers is very important as my research resources. I always get it from the faculty library or directly from the owner of the thesis”*. This indicate the researchers are not information literate in terms of sourcing out manuscript information as versions of Malay manuscripts are available in various libraries in the world. This applies also to Malay manuscript experts who are not confined only to Malaysians.

(b) Unaware of the existence of digital resources for Malay manuscripts

It is clear that some respondents were not aware of other available resources beside the print copies. One researcher commented, *“I have never heard about online resources in manuscripts collection before. All this while, I use the research material from books and thesis that are available in libraries”* said R2-FG. This is surprising as there are manuscript digital libraries available on the Web.

(c) Current Practice of Manuscript Research Activity

From the researcher’s view, besides being able to read the *Jawi* script, it is important to have skills in transliteration as R1-FG remarked, *“Transliteration is the most important process where the researcher needs to convert the old Jawi script to romanise Malay. It is very*

important for the researcher to know how to read Jawi script and have the skills in understanding the old Jawi script that is different when compared to the modern Jawi script that are being taught in schools today”.

Researchers from the Academy of Malay Studies indicated that they do not use computers or the Internet while doing their research. They felt that technology usage is unnecessary. They would use computers only for word processing their chapters, as one researcher remarked, *“I seldom use PC in my daily research. I just use it when doing the writing, most of the research sources are in hard copies and I believe that all the researchers in manuscripts studies area do research this same way”* said R7-FG.

However, when asked about using technologies to support their research, they have no problems in accepting it as a supporting tool. As indicated by one researcher, *“Beside my own experience, I also use online search engine in order to search information regarding my research”* said R3-FG.

(d) Difficulties to Find Philology Experts to Refer to and Collaborate With

Researchers were postgraduate students. Their sources of reference are usually lecturers and experts from various universities. One researcher said, *“I always keep myself in touch with experts in my research area from other universities in order to keep myself updated and get information related to my research.”* Said R1-FG.

In summary, the findings of the current study indicate a general pattern with regards to the researchers’ work process when they are carrying out their research.

4.3.3 Observations

Not all qualitative data collection approaches require direct interaction with people. Observation is a technique that can be used when data collected through other means are of limited value or is difficult to validate. For example, participants in interviews may be asked how they behave in certain circumstances. However, it cannot be ascertained whether it actually behave as they claim to be, and observations are more reliable in order to get a clearer perception on how they actually behave. In some research, observation of people is not required, and rather, the environment is observed. This provides valuable information on the environment in which the study is undertaken. For example, an action research (Nollen & Putten, 2007) involving an institution may be enhanced by some description of the physical features of the building. An ethnographic study of an ethnic population may require information about how people dress or about their non-verbal communication. In a health needs assessment or locality survey, observations can provide a broad description of the key features of the area. For example, observations may identify whether the area is an inner city, urban or rural area, and observations can describe geographical location and the size of the population. The key components of the area, such as the main industries and type of housing can be revealed by observations. The availability of services can be identified: number, type and location of health care facilities such as hospitals and health centres.

Observations are carried out in semester II, Session 2009/2010, for the “Introduction to Philology” class. The observations in “Introduction to Philology” class are carried out between in 12th January and 6th April 2010. The class is divided in two sections, consisting

of lectures and tutorial sessions. The lecturer proposes that observations are made only for tutorial sessions, as it fulfills the objectives of this study,

There is total number of 46 students in the class, and they are separated into two tutorial groups; a tutorial class with 20 students and another tutorial class with 26 students. The tutorial session chosen for this study is the class with 26 students that held from 11a.m. – 1 p.m. Table 4.4 shows the observation field notes from the tutorial sessions.

Table 4.4: Summary from Observation Field Notes

Date	Duration	Summary from Observation Field Notes
12 th January 2010	1 hour and 25 minutes	<p>The class starts at 11.10 a.m. with the total of 20 students. The class begins with a briefing session that was given by the lecturer. The lecturer explains the option of doing assignments. Basically there are two types of assignment in this semester. The first assignment involves transliteration and analysis on a chosen manuscript, whereas the second one will be given by the lecturer at the end of each class. The second assignment contributes additional information for the first assignment.</p> <p>After that, he talked on the current issues of Malay manuscripts, famous individuals in Malay manuscript community and transliteration. From his description, transliteration can be an old letter, but it must be original. Usually the form of Arabic font (<i>Jawi</i>). Students need to review the manuscripts in terms of their language, handwriting, sentences, and design. At the end of the briefing session, he mentioned that students in the class will receive extra marks from the class attendance.</p> <p>The class ends at 12.35p.m.</p>
18 th January 2010	1 hour and 45 minutes	<p>The starts sharp at 11 a.m. The lecturer enters the class and gives lecture orally. There are no supporting materials such as presentation slides. The lecturer only brings several reference books and a marker pen. The class begins with an explanation on Malay text research, the history on how people begin to write and compose manuscripts.</p> <p>Based on history, writing is initiated by English people who travel all over the world and write to record things that they see.</p> <p>The class ends with an assignment given by the lecturer, which is a research on Jan Pietersxoon Coen, a general governor. Besides that, students need to find references from these books: “<i>Pedomani Transliterasi Huruf Arab ke Huruf Rumi DBP 1988</i> (DBP Guidelines for Transliterating Arabic Letters to Roman Letters, 1988)”, an encyclopedia of Islam”, magazines, and Arabic-English/Arabic-Malay</p>

		<p>dictionary.”</p> <p>The class end at 12.45p.m.</p>
25th January 2010	2 hours and 5 minutes	<p>The class starts at 11.05a.m. The lecturer enters the class and starts his lecture on the topic: ‘<i>Kegiatan ahli filologi Belanda dalam menangani teks nusantara</i> (Portuguese philologist activities in handling Archipelago text)’.</p> <p>After delivers the lecture, the class involves presentation of students’ assignments. Students are divided into groups for the assignment, as well as lecturer given a date for presentation. They need to present what they are currently doing and students can raise questions to the lecturer in the tutorial class. Two groups present today. The lecturer gives an additional assignment at the end of the class, which is to identify the criteria of valuable manuscripts.</p> <p>The class ends at 1.05p.m.</p>
2nd February 2010	2 hours	<p>The class starts at 11.05a.m. It is starts with two more groups give presentations. The lecturer comments on the font usage in the assignment. One group presents their research on Islamic Marriage in Johore.</p> <p>After the presentation, the lecturer gives the tutorial of the day: Identify the differences between <i>Jawi</i> script and Za’ba handwriting. Students require discussing <i>Jawi</i> script in Za’ba handwriting and comparing with the current <i>Jawi</i> script.</p> <p>The class ends at 1.05p.m.</p>
8th February 2010	2 hours	<p>The class starts at 11.15a.m. The class begins with a lecture on “<i>Kegiatan Ahli Filologi Belanda</i> (Portuguese Philologist Activities)”.</p> <p>The lecturer suggests a book called “<i>Perintis Sastera</i> (Literature Pioneers) as a reference book for the assignment. The book contains summaries of Malay stories, and lecturer request students to observe how the authors use their language to elaborate a situation or scenery.</p> <p>The class proceeds with the weekly presentation by two groups.</p> <p>The class ends at 1.15p.m.</p>
1st march 2010	1 hour and 55 minutes	<p>The class starts at 11.00a.m. The lecture topic of the day is ‘<i>Kegiatan Peribumi Di Nusantara</i>’ (Native Activities in Archipelago”. The lecturer tells a story on the first local student who received a degree from University of Leiden in 1905; Prof Dr. Hussein Djajadiningrat. He also told stories of other famous people in manuscript history; Taib Osman, Kassin Ahmad and Ismail Hussein.</p> <p>The class continues with the weekly presentation. Then there is a Q&A sessions by lecturer and students regarding their assignments</p> <p>The class ends at 12.55p.m.</p>
8th march 2010	2 hours	<p>The class starts at 11.10a.m. The lecturer explains on text, and the medium used for writing in earlier generation.</p>

		<p>The lecturer suggests references such; '<i>Kamus Filologi, 1995</i>' and '<i>Filologi Melayu, Pusataka 1999</i>'"</p> <p>The class continues with the weekly presentation.</p> <p>The class ends at 1.10p.m.</p>
15th march 2010	2 hours and 8 minutes	<p>The class starts at 11.10a.m. the lecturer suggest a reference book '<i>Pelita Bahasa Melayu Penggal 1- Za'ba</i>',</p> <p>The lecturer explains the differences between manuscripts from Holland and British.</p> <p>The class continues with the weekly presentation: a group presents their research of a popular manuscript's author; they do research on the background of the author, texts written by him and his contribution to the Malay manuscript community.</p> <p>The class ends at 1.18p.m.</p>
29th march 2010	1hour and 50 minutes	<p>The class starts at 11.05a.m. The lecturer discusses the usage of <i>Jawi</i> and its history" as well as how to edit the text.</p> <p>The class continues with the final presentation by two groups.</p> <p>The class ends at 12.55p.m.</p>
5th April 2010	2 hours and 15 minutes	<p>The class starts at 11.00a.m. The lecturer discusses the role of philologists, "teks tunggal", "teks jamak".</p> <p>The class continues with a long Q&A session. The lecturer is asked regarding tips for examination as well as final touches of the assignment.</p> <p>The class ends at 1.15p.m.</p>
Study Week (assignment submission)		
Examination Week		

The data of the field notes that had been collected were analyzed using went through the thematic analysis process and as a result a lists of themes is generated as the following:

a) Beginning of the Class

When the lecturer arrives at 11am, the tutorial room is already opened as the room has been used by a previous class. A quarter of the students are already in the room and most of them sit in groups. One of the students check on the utilities such as fan and light to ensure that

they are working for that day. The lecturer begins the class by giving an attendance sheet which needs to be filled by the students. All the students arrive 5 minutes later and the class is ready to begin.

b) Group Presentations

The lecturer calls on the group that is supposed to present their current assignment progress to the class. Each presentation lasts approximately 10 minutes, including question and answer session. Other students are permitted to give comments and ideas on the presented research during presentation. Students in the group also take the opportunity to consult the lecturer for advice.

c) Assignments

After general reminders on the do's and don'ts during the assignment process, the lecturer shows the student a sample of assignment. The lecturer then discusses on the final assignment and emphasizes on the goal of combining various skills learned throughout the semester. The lecturer usually begins the discussion by asking students what they already know about Malay manuscripts. the students responded with various answers.

The class moves into a specific assignment for a group of students. They discuss on the topic assigned to the particular group. The lecturer reminds students on the significance of the transliteration process. The lecturer includes information from his knowledge and experience regarding the assignment topic. Another group then presents their work, which is followed by a discussion between the students and the lecturer.

In addition to the main assignment, the lecturer provides a simple tutorial such as research of Malay manuscript authors, the background of the manuscripts and the physical criteria of the manuscripts. These findings must be submitted with the main assignment. The lecturer recommends several reference books and dictionaries as a guideline for the transliteration process.

Description of the Assignment:

The lecturer describes the details of the assignment during the first tutorial session and offers options for doing the assignment, i.e. research on the manuscript's authors (the background and contributions), manuscripts issues and transliteration process. Students are divided into groups of 2-4 people, and are requested to find a manuscript. The lecturer provides several criteria for the manuscripts which the students need to search on. In the third week, the students are expected to have a suitable manuscript that has been approved by the lecturer. The lecturer prepares a schedule for weekly group presentation, in which each group needs to present their progress on the allocated date. The assignment consists of an introduction of the manuscript which describes the background and the author, the transliterated version of the manuscripts and analysis. The analysis section discusses the physical text and content analysis of the manuscript. The assignment needs to be compiled and the printed version of the final assignment needs to be submitted during the study week. The marks are 100 percent % given by the lecturer, and the assignment contributes 40 percent% from the overall grade for the course.

d) Questions and Answers Sessions

Questions and Answers session is being held from time to time throughout the tutorial session. The lecturer and students frequently ask one another. Questions and Answers

Sessions last for half an hour. The lecturer responds to the students on the types of sources appropriate for the assignment, and reminds them to use their own knowledge on what is considered as an “appropriate source” for a Malay manuscript assignment. The lecturer sorts through the manuscripts chosen by each group in the second and third week to ensure that the manuscripts are suitable before the students embark on the assignment.

In the last 12 minutes of the class, the lecturer prompts the students to ask questions. A few students raised some questions. The lecturer reminds again the deadline of the assignment and informs students to always work with their respective groups in order to complete the assignment within the specified time frame. The lecturer speaks with the students while they work in groups; however, he only makes his way halfway around the room when the class ends. The lecturer remains in the classroom even after the class is dismissed so that students can consult, discuss or ask questions. Figure 4.2 shows the rich picture of the class observation that obtained from the analysis of the field notes.

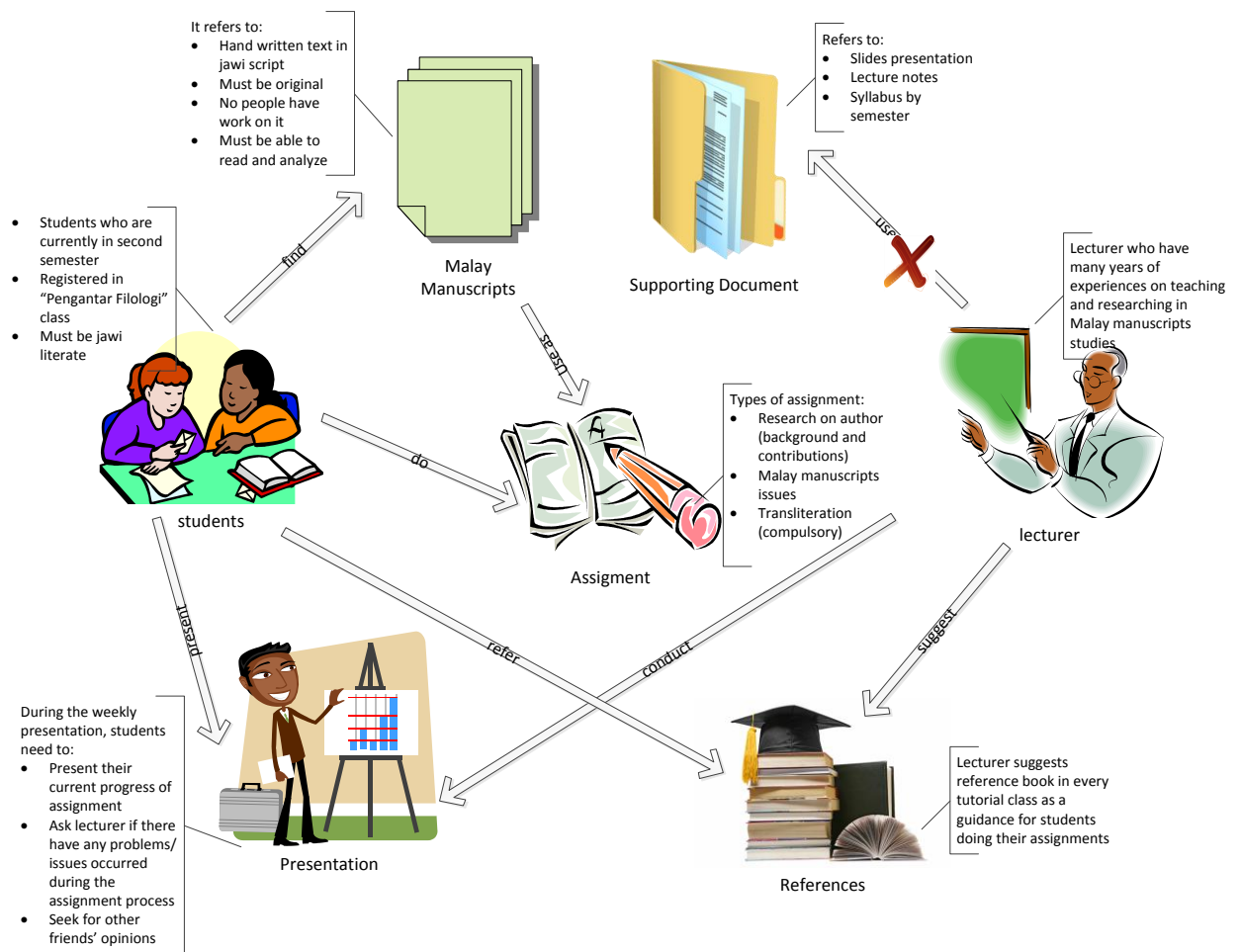


Figure 4.2: Rich Picture of Class Observation

The class observation basically covers the process of teaching and learning of Malay manuscripts that being one of the final themes.

4.3.4 Discussion of the Findings: Themes of Problem Situation and Rich Pictures

As discussed in section 3.5, the results from all the paleographers (lecturers, students and researchers) once again were coded and as a result, a simplified list of themes was generated from the data obtained. Table 4.5 is generated from the thematic analysis process for lecturers that obtained from the interviews that had been discussed in section 4.3.1.1.

All the transcribed data went through the coding process and a list of minor categories is generated. Then, it is simplified to the list of major categories before the final themes are generated.

Table 4.5: Themes emerged from Lecturers

Themes	Major Categories	Minor Categories
Process of Teaching and Learning from lecturer's perspective	Using Methods	Transliterations Annotations Transcriptions
	Own knowledge	Knows <i>Jawi</i> Research Experience
	References	Lecturers Experts Dictionaries Discussions Reference books
	Assignments	Transliterations Analysis Research of manuscript's author
Current Problems faced by lecturers	Availability	Time Real Philologist Malay manuscript resources Budget
	Awareness	Regulations Understanding on <i>Jawi</i> Overlapping works
	Attitudes	Lack of initiatives Own belief
Lecturer's viewpoint on initiatives to preserve Malay manuscripts	Initiative	Society Websites preserve old manuscripts
Lecturer's awareness towards electronic environment of Malay manuscripts	Good responses	Malay manuscript resources Good use of time Promoting Malay manuscripts
	Bad responses	Laziness Ownership Legality
	E-workspace proposed modules	Transliteration tools Malay manuscript Dictionaries Discussion tools Catalogues

The themes collected are described in the rich picture, as shown in Figure 4.3.

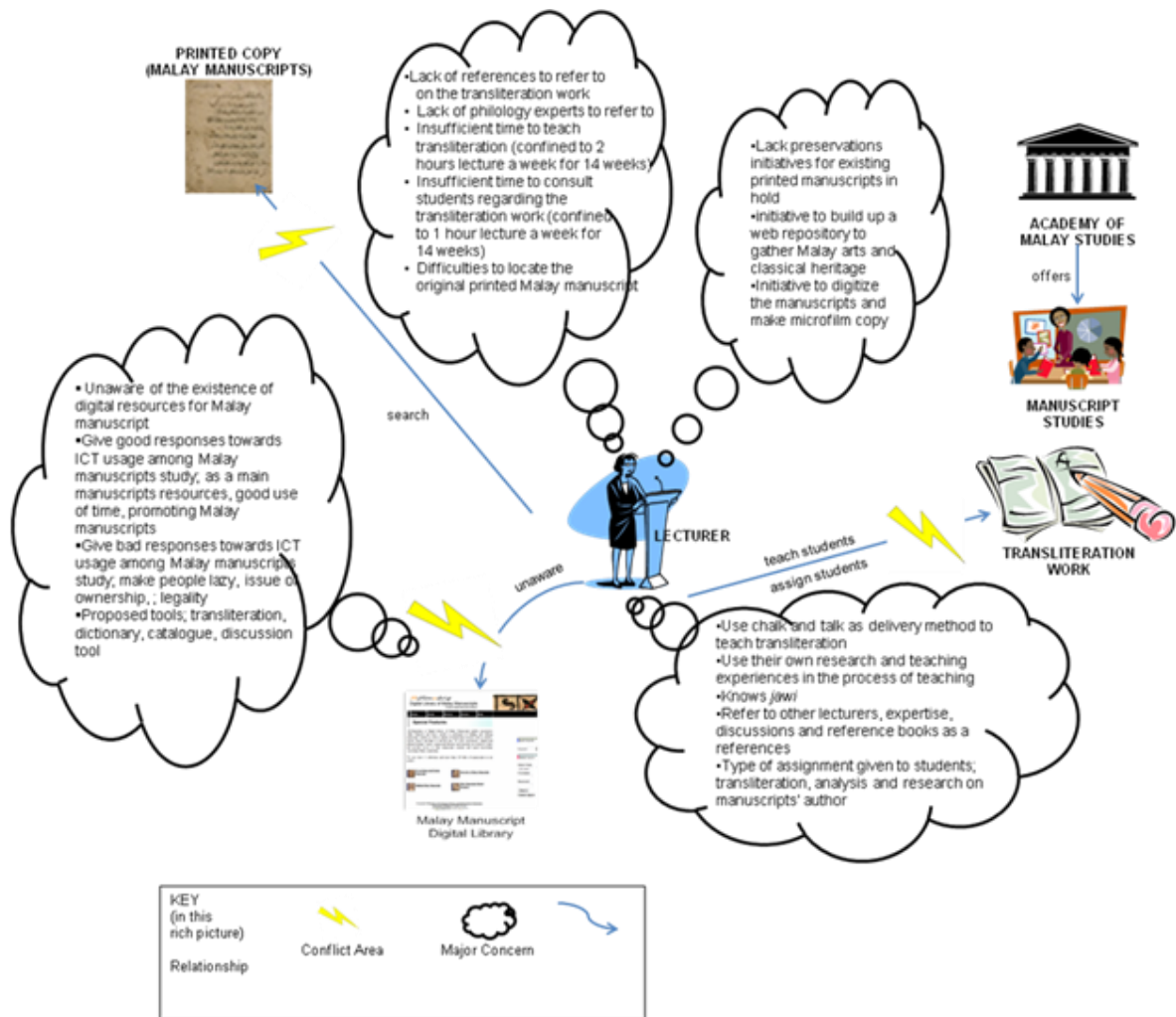


Figure 4.3: Rich Picture of Lecturers from the Interviews

As discussed in section 4.3.1.2 and section 4.3.2.1, themes that generated from the interview and focus group sessions were simplified through the coding process and as a result, the list of themes as shown in Table 4.6 was generated.

Table 4.6: Themes emerged from Students

Themes	Major categories	Minor categories
Context used in Malay manuscript studies	Language used	Arabic From Holland and Europe
	Writing	Font Type of paper Years since production
	Author	Background Contributions
Users of Malay manuscript studies	Lecturers	Research Teaching
	Students	Postgraduate students Undergraduate students
Malay manuscript usage	Class	Assignment Examination questions
The Motivations on using Malay manuscripts	Assignments	Tutorial classes Lecture request to search for manuscripts
	Self interest	Exposures from Family Taking art subjects during secondary school
Problems while using Malay manuscript	Resources	Malay manuscripts Experts for references
	Transliteration process	Time Type of <i>Jawi</i> script Age of Malay manuscripts Knowledge
Process of Malay manuscript studies	Self finding	Library Own collection
	Reading and transliterating	Knows <i>Jawi</i>
	Analyzing	Contents Author Language
Improvement of Malay manuscript studies	Offered Courses	In APM Other faculties in the university
	Initiatives	Promote Malay manuscripts Save/Preserve Malay manuscript collection
	Awareness	Age of manuscripts Course Syllabus

		Lecturer's experience
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From the list of themes generated above, a rich picture was drawn in order to show a clearer picture on the current activity and also the problems and issues rose among students. Figure 4.4 shows the challenges, issues and problems encountered by students when conducting their assignments in the form of a rich picture.

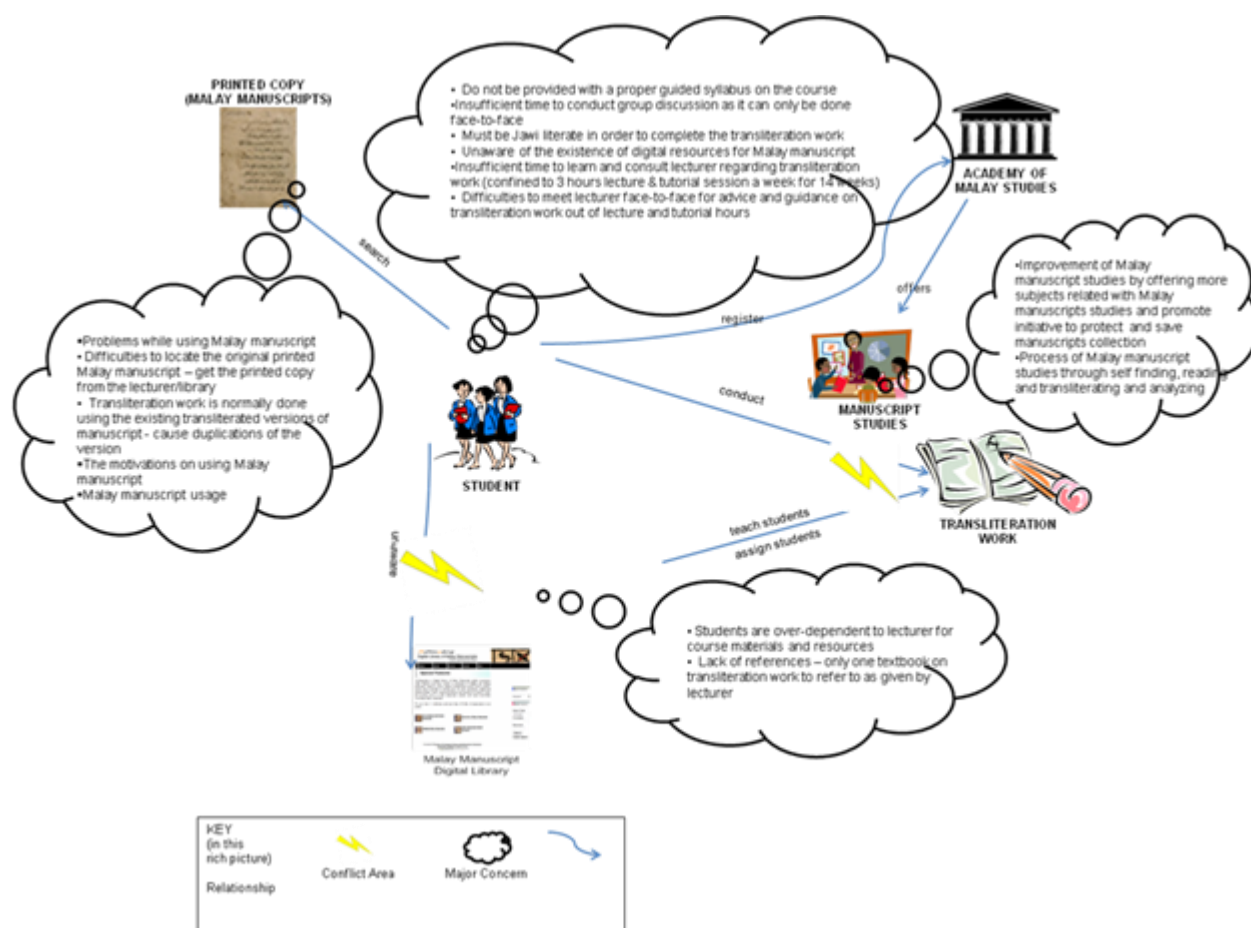


Figure 4.4: Rich Picture for Students

The themes that reflect the researchers' needs, problems and issues as discussed in section 4.3.1.2 and section 4.3.2.2, are presented in Table 4.7 while Figure 4.5 shows the rich picture for researchers that represent the current problems and issues faced by them.

Table 4.7: Themes emerged from Researchers

Themes	Major Categories	Minor Categories
Difficulties to locate original printed Malay manuscripts	Limited	Many of Malay manuscripts are self-collections and are hard to locate Several collections are available overseas
	Protected collection	Collections in National Library are fully protected and not easily accessible Malay manuscript ownership Requires payment for full access
Lack of references– e.g. dictionaries, theses & journal articles	Theses and journal articles	Faculty's collections Online collections Lecturers' collections
	Limited reference books	Library collections Online collections
	Dictionaries	Malay Classical dictionary Malay manuscript translations
Unaware on the existence of digital resources for Malay manuscripts	Seldom usage of Web based systems No promotion Aware of the existence of other collections but with limited access	
Requires dictionaries to support transliteration work	Knows <i>Jawi</i> , but sometimes unsure with certain words Always refer to glossary of a paper and thesis	
Difficulties to find philology experts to refer to and collaborate with	Lecturers Other researchers Lack of expertise	

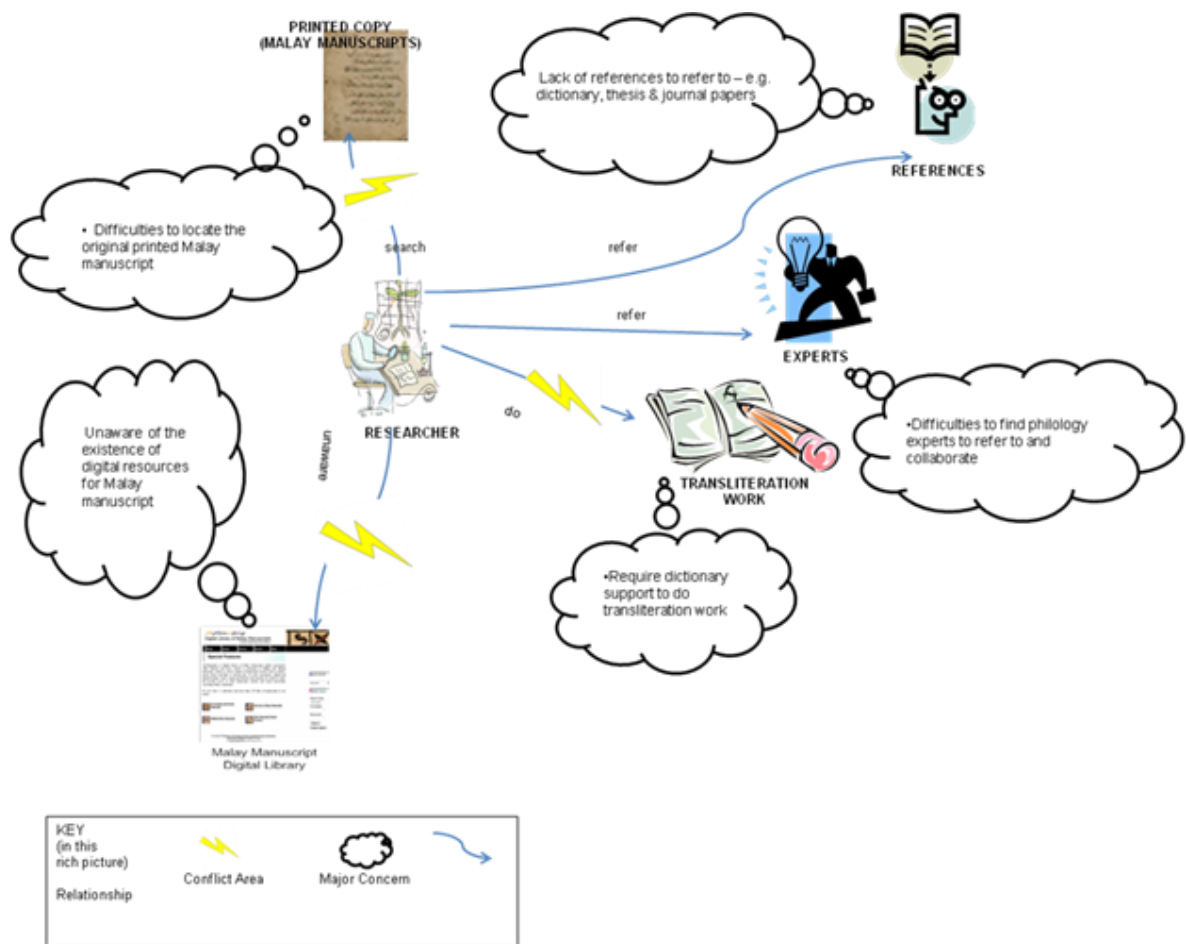


Figure 4.5: Rich Picture for Researcher

From all the themes above that had been generated from three types of stakeholders (lecturers, students and researchers) through the interview, focus group sessions and class observations, all the themes once again went through the coding process and consequently, three final themes are identified:

1) *Teaching, Learning & Research Practiced*

During the interviews, the lecturers describe that transliteration is the main process when teaching Malay manuscripts. Transliteration is the process of mapping from one system of writing into another, word by word, or ideally letter by letter, and in this course, students are required to transliterate old *Jawi* scripts into Romanized Malay without changing

phonetics and grammar. One of the lecturers (L3) said, *“There are fixed methods taught in class, and these methods can be found in the reference book. The methods are transliteration, transcription and annotation.”* However, these methods are carried out manually. When asked regarding the process of learning a Malay manuscript, one of the lecturers (L5) replied, *“Firstly, students need to do the transliteration, followed by analysis. If the the transliteration is incorrect; this will result in an incorrect analysis. I will usually ask them to see librarians from the National Library to help them improve their work”*.

Another (L1) remarked, *“As a philologist, all you have to do is to know how to read the manuscript and conduct analysis”*.

The improvement to current teaching and learning practiced in this context refers to basic processes such as transliteration, annotation and analysis. In the current process of teaching and learning, firstly, users need to locate a Malay manuscript by themselves. In the proposed system, users will use the resources held in *MyManuskrip*. This is also refers to the users’ feedback about what they need and expect to have in the manuscript studies. It is proposed that *MyManuskrip* digital library could surrogate copies of original manuscripts on varied subjects for users to utilize in their teaching, learning and research.

2) *Supporting Resources for Manuscripts Studies*

Supporting resources refer to the time allocated for manuscript studies, availability of printed original manuscripts, problems faced by students following the manuscript studies course, availability of preservation initiatives and availability of experts.

- **Time allocated for manuscript studies**

Lecturers claim that manuscript studies are covered in a single course which is “Introduction to Philology”. One lecturer (L5) remarked, *“In each semester, there are 14 weeks for lecturers to teach, which is problematic for us as we have to optimize this limited time”*. This shows that the lecturers feel that the time allocated for manuscript studies is insufficient.

- **Supporting Resources**

A lecturer (L1) commented, *“The students are always complaining that it is difficult to find Malay manuscript resources. This year, our manuscript unit is gathering all the manuscripts that we can find and keep them at the Academy. However, the students still complain that the manuscripts are not easily accessible and that the number of manuscripts is limited. To rectify this problem, I do not have a choice, but to make them refer to the printed versions of manuscripts which are simplified versions prepared by other researchers”*. Hence, students are requested to work on printed or edited versions of Malay manuscripts rather than the originals, which implies that they work on the works of others. This results in duplication of transliteration works. Further investigation is required to verify whether this method simplifies the learning of transliterations. This problem is also raised by one student (S3-I), who stated, *“Searching for manuscripts that have never been used by previous students is a problem to us. There is a lack of Malay manuscript resources easily available.”* This indicates that both lecturers and students face problems in locating and accessing manuscripts for transliteration assignments.

- **Students Signing-up for Philology Course**

Lecturers indicate that there are students who do not know how to read *Jawi* but they enroll themselves in the “Introduction to Philology” course. The lecturer feel sympathizes with the students but are unable to help much due to the fact that *Jawi* is too fundamental to be taught at tertiary level. This implies that lecturers face problems when there are students who are unable to read *Jawi* but they have signed up for the course.

- **Initiatives to Conserve Manuscripts**

Preservation of old manuscripts requires initiative and budget. One lecturer (L3) commented, *“As I mentioned, the people from Department of Arts need to have an initiative to learn, but I never see that. I can see that people from other departments such as me who are more interested compared to them.”*

Another (L1) remarked, *“In Universiti Malaya, there is presently no ‘special’ place to store the original manuscripts. Manuscripts need to be located in a room with a suitable temperature, whereby people cannot simply enter the room. They need to wear protective masks and gloves in order to preserve the manuscripts that are old and fragile. There are regulations on this matter, but most people are not aware of it”*. L1 added that, *“Currently, all manuscripts are located in the main library, but there is nobody to care for the manuscripts. For me, I can build a room for manuscripts, but I need financial support which is less than RM100,000”*. This indicates that the lecturers believe that there are no initiatives to conserve Malay manuscripts. They are aware of the need of conserve manuscript collections; however, the amount stated for conservation work is actually unrealistically low.

- **Experts in Manuscript Studies**

One lecturer (L4) stated, *“In APM, there are no philology experts”*. Another lecturer (L5) said, *“At APM, there is a society that is responsible for promoting Malay manuscripts and literary works and they are currently progressing by making plans to protect old manuscripts. Some lecturers in APM are concerned on saving old manuscripts. They microfilmed and digitized the manuscripts out of their own initiative”*.

The main issues that have been identified from this study are time constraints, resources and initiatives. In the proposed system, lecturers, students and researchers can assess the digital resources and all facilities provided at any time without any boundaries or borders. It becomes possible for discussions, problem solving, transliterations and annotations to be carried out interactively and collaboratively.

3) *Technology Use and Acceptance*

One lecturer believes that automation projects make students lazy and learning in an electronic environment is insufficient to become a philologist. One lecturer expresses his concern regarding making manuscripts available on the Internet, and argues over the ownership of such manuscripts as well as the legality of making manuscripts accessible on the Web. The lecturer (L1) commented, *“Actually, this electronic thing will make people lazy. Philologists have to know the physical aspects of the manuscripts, as well as they need to feel and touch the original manuscripts. There is no guarantee that all information on the Internet is true.”*

This refers to the general views of the users on the new technologies usage today. From the findings, technologies should attract more users to use technological support tools for teaching, learning and researching. This would be a new environment for Malaysian Malay manuscripts communities.

A rich picture that combines all paleographers (lecturers, students and researchers) is developed from the final themes, as shown in Figure 4.6.

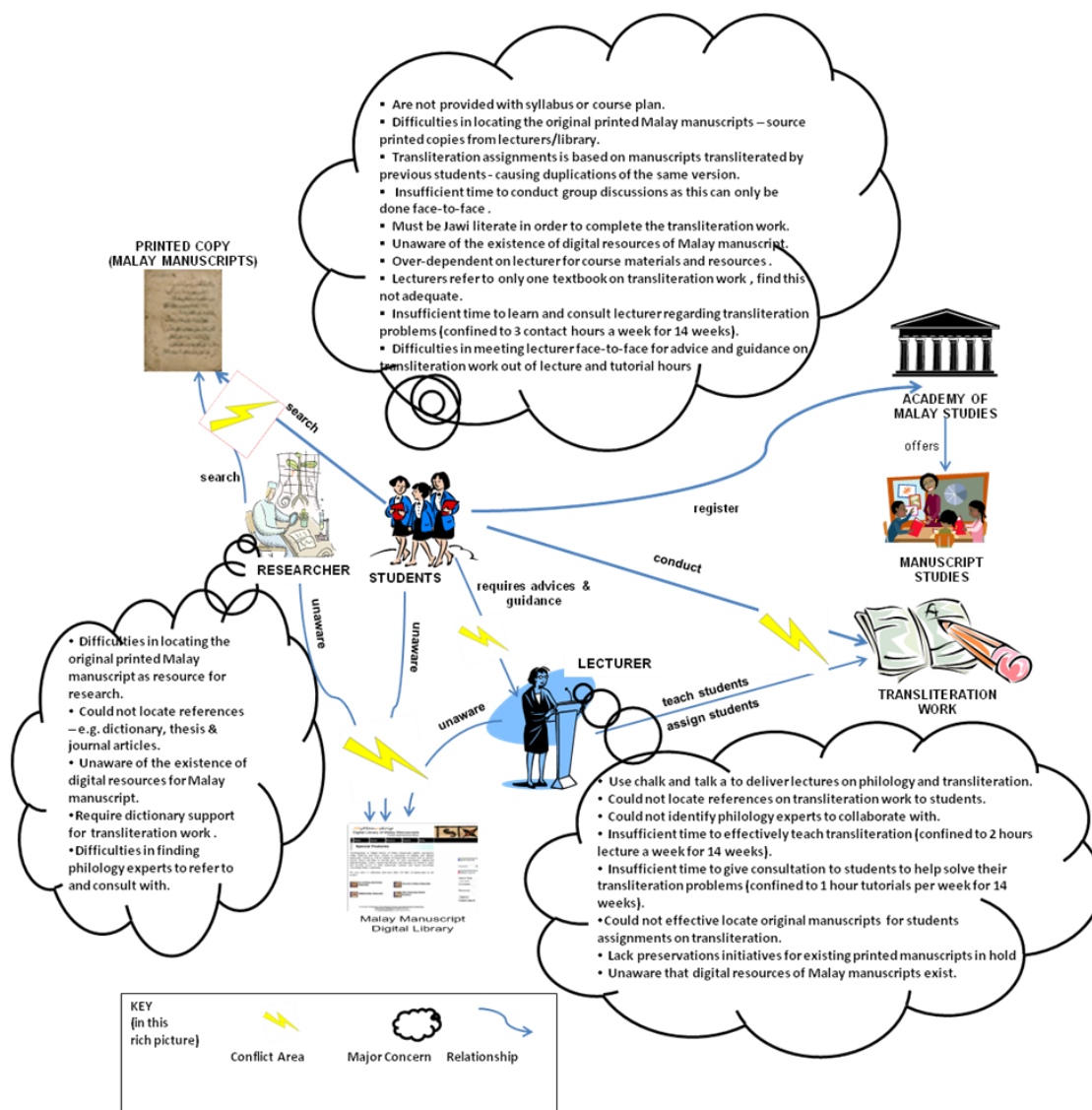


Figure 4.6: Problems Expressed by Students, Lecturers and Researchers in a Rich Picture

4.4 Phase 2: Defining the Root Definition

4.4.1 CATWOE Analysis

The CATWOE criterion forms the basis for the formulation of a root definition. The criteria need to be defined and translated into a root definition which will describe the human activities that have to be modelled. Patching (1987, cited in Lewis, 1992) stated that “*a root definition is a statement of what the system shown in the rich picture is designed to achieve, based on either on the issue which has been uncovered, or on the primary task of the organization*”. As mentioned earlier, a transformation process is required, which will involve inputs and outputs. The researcher has identified that the inputs are lecturers, students and researchers. The outputs are lecturers who are satisfied with the students’ performance towards the Malay manuscript studies, students who are manage to perform transliteration process collaboratively with group members in order to achieve the “Introduction to Philology” course objectives, researchers who can carry out research systematically while discussing and collaborating with experts and peers in order to successfully complete research in Malay manuscripts studies and an effective process of teaching, learning and research amongst lecturers, students and researchers.

Table 4.8 shows the elements of the root definition through CATWOE analysis in detail.

Table 4.8: Elements of the Root Definition and CATWOE Analysis

Element of CATWOE	Description	CATWOE analysis for this research
Customers	Who are the victims or beneficiaries of the transformation?	Manuscript lecturers Manuscript students Manuscript researchers The public accessing Malay manuscript collections
Actors	Who makes the transformation happen?	Manuscript librarians in charge of governing Malay manuscript collections
Transformation	What are the inputs and (transformed) outputs?	Current uncondusive environment of teaching, learning and researching Malay manuscripts to an accommodating environment
Weltanschauung	What makes the transformation meaningful in context?	A conducive medium for teaching, learning and researching Malay manuscripts that support interactive and collaborative works in a digital environment
Owners	Who can stop the transformation process?	FCSIT or collaborating Malay manuscripts repositories in Malaysia
Environmental Constraints	Which elements outside the system are taken as given?	Technology use and acceptance Collaboration between researchers

4.4.2 Root Definition

Stage 3 looks at the problems illustrated from the rich picture and propose solutions for improvement by delineating a “root definition” using the mnemonic CATWOE analysis. The root definition is essentially a hypothesis of the relevant situation and improvements that may help resolve the problem situation. Therefore, the working root definition for the Malay manuscript community is:

“An instructor/lecturer owns an operating system to provide a conducive medium for teaching, learning and researching, by giving them assignments through potential electronic working space such as transliteration and annotation tools in order to support collaboration work amongst researchers/lecturers/students and people involved in Malay manuscript studies via a digital environment.”

In order to solve the problem situation illustrated in the rich picture, relevant solutions are proposed through a root definition, which is to provide a conducive medium for teaching, learning and researching Malay manuscripts that is highly interactive and supports collaborative work via a digital environment. Hence, the features of the proposed solution are defined and a conceptual model is developed to exhibit interactions between different views of stakeholders and describe the system processes to achieve the desired transformation. One proposed example is to enable students to conduct group discussions that are not constrained by time and location, unlike the current system where students are confined within the 1 hour tutorial session for 14 weeks. In this manner, students will be able to interact with their peers and lecturers during the transliteration assignment.

Finally, the rich picture is re-designed into a new conceptual framework, which proposes that processes for teaching, learning and researching Malay manuscripts are carried out in a digital environment in order to resolve the issues and problems identified in the current system. Details on the desirable changes that should be undertaken are analyzed, followed by the actual implementation of the E-workspace system linked to a digital library (*MyManuskrip*). This system supports the teaching, learning and research activities utilizing resources from *MyManuskrip*. This will greatly facilitate manuscript access problems highlighted by Ding (1981), Manaf (2008) and all stakeholders in this study. The digital environment will also support transliteration and annotation activities, enable lecturers to upload their syllabus and teaching resources, and support interactivity in terms of student-lecturer and student-student discussions. This system enables uploading transliterated assignments as a collection in *MyManuskrip*; and provides glossary of terms to assist manuscript researchers. In general, the proposed solution supports collaboration and

knowledge dissemination while promoting the use and study of Malay manuscripts to a wide range of audience.

4.5 Summary

This chapter presents the analysis of data collected to investigate the issues and challenges in manuscript study which provides a clearer picture of the problem and the factors that influence the manuscript community. Three themes which are (i) Teaching, learning and researching practiced, (ii) supporting resources for manuscript studies and (iii) technology use and acceptance were identified and the analysis that correlates the themes with teaching, learning and researching Malay manuscripts in Academy of Malay Studies, University of Malaya are identified and discussed. A rich picture was used to depict the findings according to SSM requirements. The final stage of this phase, which involves CATWOE evaluation and formulation of the root definition, is presented.

CHAPTER 5

FORMULATING THE CONCEPTUAL MODEL: PHASE 3

5.1 Overview

This chapter discusses the third research phase which is to formulate and construct a conceptual model based on CATWOE analysis and root definition. The conceptual model describes activities required to enable the stakeholders (paleographers in manuscript community) to achieve the desired transformation in a proposed solution (the E-workspace).

5.2 Conceptual Model of Malay Manuscript E-Workspace

A conceptual model was constructed to demonstrate how paleographers carry out various activities in the current system (manuscript studies) based on the root definition. The conceptual model exhibits how technology can facilitate paleographers in manuscript studies by mapping the current process into a proposed system. The conceptual model needs to include both operational and supervisory activities. The operational activities are derived and formulated from published literature, as well as data collected and analyzed from the initial portion of the study. These activities are also delivered from lecturers and students who involved in teaching and learning process in “Introduction to Philology (JEEA3321)” course conducted by APM, UM as well as researchers who engaged in manuscript research work.

Therefore, via the system, the transformation is expected to provide the paleographers with the following activities:

(a) Lecturers:

- Upload and update course syllabus and learning materials 24/7
- Conduct online discussions with students, as well as other lecturers and researchers 24/7
- Use online transliteration tools for teaching
- Assign transliteration works online to individuals/groups of students
- Assess students' work online and provide feedback from time to time
- Annotate manuscripts and share them with students, colleagues and researchers
- Access digital collection of Malay manuscripts 24/7
- Invite experts and philologists to join the manuscript community for research collaborations.

(b) Students:

- Access learning materials and course syllabus 24/7
- Conduct online discussions with lecturers and course mates
- Use online transliteration tools 24/7
- Annotate manuscripts and share them with course mates and lecturers

(c) Researchers

- Access digital collection of Malay manuscripts 24/7
- Upload and update additional references 24/7, such as glossaries
- Use online transliteration tools for research purposes 24/7

- Conduct online discussions with researchers 24/7
- Annotate manuscripts and share them with other researchers
- Invite other experts and philologists to join the manuscript community for research collaborations

Figure 5.1 shows a complete conceptual model for Malay manuscript. The conceptual model presents as an electronic workspace to facilitate paleographers in teaching, learning, and researching Malay manuscripts.

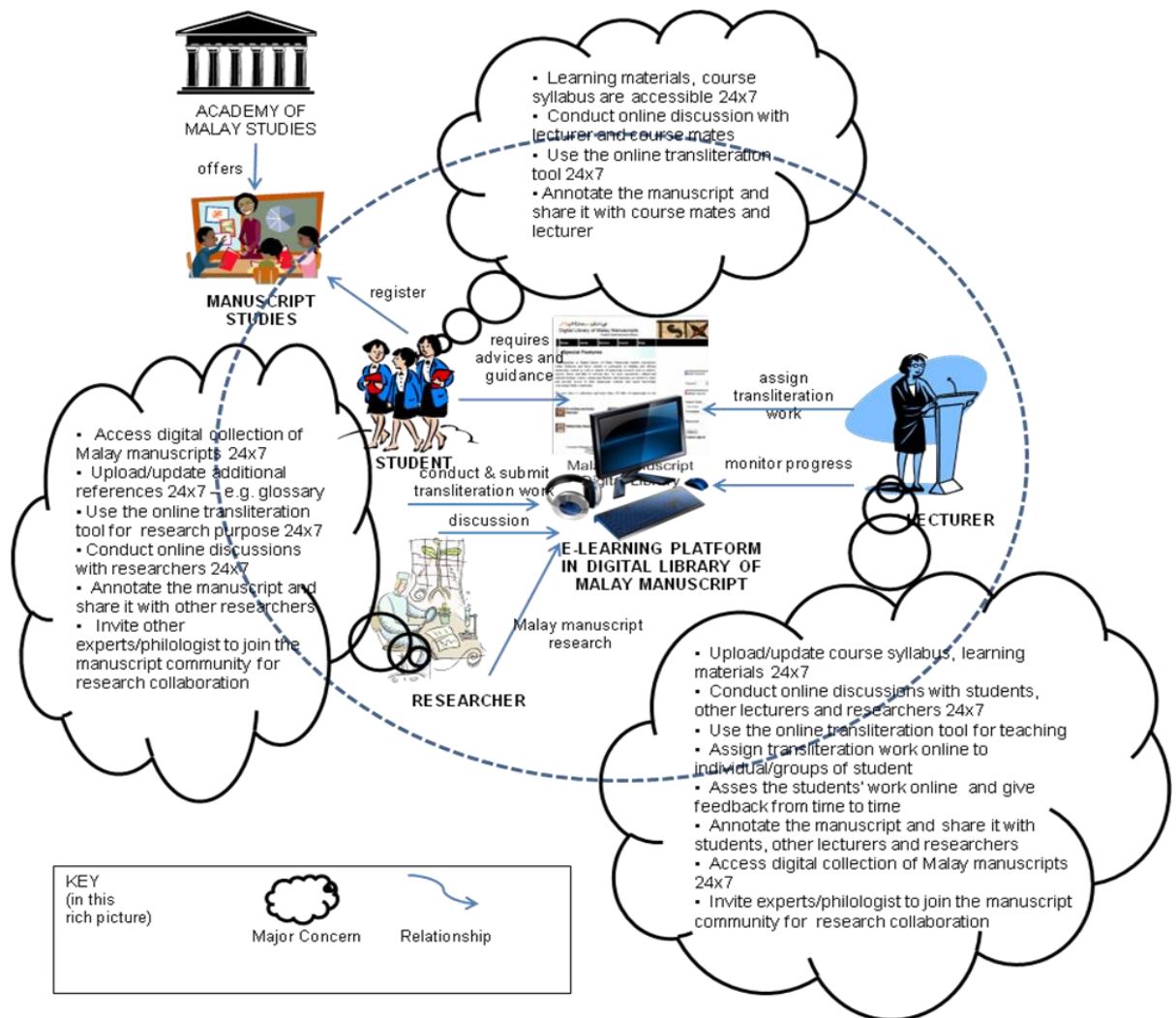


Figure 5.1: Conceptual Model of Malay Manuscript e-Workspace

The results from data collection have a variety of implications for the design of content creation, tools and modules in the workspace, as well as the display format of the reports, as indicated in Table 5.1. The design implications populated are expressed in the conceptual model (see Figure 5.1).

Table 5.1: Sample from Document Analysis and Corresponding Design Implications

Themes	Data Sources	Design Implications
Teaching and Learning Manuscripts Currently Practiced	<p>From Interviews:</p> <p><i>“There are fixed methods that have been taught in class, and these methods can be found in reference books. The methods are transliteration, transcription and annotation. However, these methods are all done manually”. L1</i></p> <p><i>“Firstly, students will conduct transliteration, followed by analysis. If they transliterate incorrectly, this results in an inaccurate analysis. I will usually ask them to consult librarians from the National Library to assist them in improving their work” L2</i></p> <p><i>“As a philologist, all you need to do is to know how to read manuscripts and perform analysis” L3</i></p> <p><i>“He usually comes into class with his marker pen and books, and give lectures based on his experience as well as books. There is no such thing as presentation slides and he gives lectures in the old-fashioned way” S2</i></p> <p><i>“Prof will usually provide options for students. The first one is to choose a manuscript and do transliteration and research on it, while the other one is research on the philologists whereby students need to search for one philologist and do research on him or her.” S1</i></p> <p><i>“Transliteration is the most important process whereby the researcher needs to convert old Jawi script into Romanized Malay. It is very important that researcher knows how to read Jawi script and acquire the skills in understanding old Jawi, which</i></p>	<p>The need of a collaborative workspace is which class members can work together. Provide a function that can invite others such as librarians to join the class in order to provide references for students.</p> <p>A module that provides transliteration process via online, where students can discuss concurrently.</p> <p>A workspace where lecturer can share documents such as lecture notes and related article before and after classes.</p> <p>Various file sharing: a tool that can support file formats such as .pdf, .doc, .ppt and .jpeg.</p> <p>A text editor that can be updated by group members within the time given. The text editor acts as a ‘Wikipedia’.</p>

	<p><i>is different than the modern Jawi being taught in schools today” R1</i></p>	
	<p>From Focus Groups: <i>“For philology class, there is currently no syllabus provided by the lecturer at the beginning of the class such as the objectives of the course and weekly plans” S1-FG</i></p> <p><i>“We are lucky to be in the philology class and have an opportunity to learn Malay manuscripts. I think it is good to open this course to all students from various faculties which helps us learn and know the creative works of our previous ancestors” S5-FG</i></p>	<p>The need of single Malay manuscript resources where selected transliterations will be published in the repository and this can promote Malay manuscripts to others.</p>
	<p>From Observation Notes:</p> <p><i>“There is basically 2 types of assignments given during the semester. The first one involves transliteration and analysis on a chosen manuscript, while the other will be given by the lecturer at the end of each class. The second assignment is to contribute additional information to the first assignment.”</i></p>	<p>The need to include report grading feature for lecturers. Marks are automatically calculated and grades are generated.</p>
<p>Supporting Resources for Manuscript Studies</p>	<p>From Interviews: <i>“The students are always complaining that it is difficult to search for Malay manuscript resources. This year, our manuscript unit is gathering all the manuscripts that we can find and keeping them at the Academy. However, students still complain that it is difficult to access them and the number of manuscripts is very limited. In order to solve this problem, I don’t have much choice but to make them refer to the printed versions of manuscripts which are simplified versions carried out by other researchers” L3</i> <i>“To find Malay manuscripts that have never been used by previous students is somewhat a problem to current students. There is a lack of Malay manuscript resources that are easily available.” L1</i></p> <p><i>“Prof always makes sure that we are not working on manuscripts that have been analyzed by other students/researchers before. Since it is just a waste, he wants a contribution of something new.” S2</i></p>	<p>The need of a single resource of Malay manuscript collections. This prevents duplication and redundant works. A module that compiles all students’ assignments (transliterated works) for future reference. The lecturer can prevent the possibility of redundant works by referring to the list of published works.</p>

	<p><i>"I have never heard about online resources for manuscript collections before. All this while, I use research materials from books and theses that are available in libraries"</i> R2</p>	
	<p>From Focus Groups:</p> <p><i>"There are no specific resources where we can easily locate Malay manuscripts. Besides the main library, we usually obtain the manuscripts from our own collections at home. However, we need to show them to our lecturer first and get his approval before we proceed with our research on the manuscripts"</i> S1-FG</p> <p><i>"In the class, the discussion is limited only between students and lecturer. Therefore, everything is based on the lecturer's knowledge"</i> S2-FG</p>	<p>The need of a communication module such as forums, where discussions are made publicly, messaging, where class members can communicate privately and open to certain members by invitation; and chats, real time messaging among the group members or public chats.</p>
	<p>From Observation Notes:</p> <p><i>"Class begins with the lecture on "Kegiatan Ahli Filologi Belanda" and the lecturer suggests a book "Perintis Sastra" as a reference book for the assignment. The book contains summaries of Malay stories, and the lecturer asks students to see how the author uses language in elaborating a situation or scenery. "</i></p>	<p>The need of file sharing amongst lecturers and students. Lecturers can upload electronic reference books for students to refer.</p>
Technology Use and Acceptance	<p>From Interviews:</p> <p><i>"Actually, this electronic thing will make people lazy. Philologists need to know not only the physical aspects of the manuscripts, but they need to feel and touch the original manuscripts. There is no guarantee that all information in the Internet is true"</i> L3</p> <p><i>"This collection of manuscripts is really helpful because all this while students find it difficult to search for manuscripts"</i> L1</p> <p><i>"I seldom use PC in my daily research. I just use it for writing. Most of the research sources are in hard copy and I believe that the researchers in manuscript studies area conduct research in the same manner"</i> R1</p> <p><i>"Besides my own experience, I also use dictionaries to help me in transliteration work. There are quite a number of dictionaries in the market, but so far I think "Kamus Melayu Klasik" is the best</i></p>	<p>The need of personal workspace. Students can customize their personal profile settings and make them interesting according to their personal preferences. Provide an individual file management where students can upload and save all their works via the system.</p> <p>The need of an online Malay classical dictionary where students can refer to them when it comes to difficulties finding the meaning of a word during the transliteration process. It will be updated by the lecturer from time to time according to needs.</p>

	<i>dictionary for Malay manuscript studies. If this dictionary can be digitized, it will be very helpful” R1</i>	
	<p>From Focus Groups:</p> <p><i>“When I was involved in the exchange student programme with a student from China, we are connected through a blog and I find that it is very helpful for us to work together anytime and anywhere”. S6-FG</i></p> <p><i>“It is good to have such a repository [proposed by the researcher] on the Web where we can share everything related with the subject, so that we do not solely rely on the 4 hours a week to do our research on Malay manuscripts”. S8-FG</i></p>	The need of a communication tool where students can collaborate together.
	<p>From Observation Notes:</p> <p><i>“The lecturer comes into the class and gives lecture orally. No supporting materials such as slide presentations. The lecturer only brings together some reference books and a marker pen. The class begins with an explanation on the research of Malay text, the history on how people start to write and compose manuscripts. From history, writing originates from English people who travel all over the world and write to record the things that they see.”</i></p>	The need of module on collaboration works between classes and between lecturers and students. Students do not have to waste their time copying lecture notes while the lecturer gives lectures.

These themes are generated through coding process from three data collection methods used in this study, namely, interviews, focus group discussions and observations. The quotes in the “Data Sources” column are selected based on the highest similarities and repetitive results during the data collection process. From the data, the “Design Implications” column shows how the tools and modules in the E-workspace can be generated. The details on the modules are described in Section 5.3.

5.2.1 Validity of the Conceptual Model

As in all investigations involving modeling, the question of validity for the models developed is now given focus, as part of an SSM enquiry. The requirements for establishing the validity of the models depends on the type of model being constructed and the use that is to be made of it. Validity is commonly described as the extent to which the model can be considered as an adequate representation of reality. However, in the case of SSM, the conceptual models constructed may be of systems that are not actually in existence. Thus, conformance to reality is not an appropriate question to consider. Examining the validity of models generated as part of a soft system enquiry is difficult and Checkland (1993) suggests that there are two aspects that can assist to differentiate a good model from a bad one. These aspects relate to whether the models developed are in any sense relevant and whether the models are competently built. The question of competence relates to ensuring that the root definitions and conceptual models have been derived systematically from the rich picture and the issues identified within it, and that the conceptual models are built only from the root definition. The relevance of the models is a matter for the participants to determine and is related to the extent to which the models generated improve the understanding of issues and the generation of subsequent actions.

This investigation results in a number of changes to the module, particularly to the way in which support sessions are organized. It is felt that a firmer understanding of the needs and expectations of the stakeholders has been gained, which gives considerable validity to the models developed. Furthermore, the issues described within the rich picture are in agreement with a small selection of stakeholders from the original sample, and

the subsequent changes made to the module are formally validated through the university quality assurance process. It is too early to tell whether the overall performance of the current process is enhanced by the changes made by applying the conceptual model into the E-Workspace system. However, anecdotal evidence from stakeholders (which is paleographers) seems to confirm that the support sessions are appreciated by them and there is a positive feedback from the usability testing of the system. This will be described in the following chapter. Full evaluation is only possible when the system prototype goes live and the paleographers officially use it as their main workspace in manuscripts studies.

5.3 Development of the Malay Manuscript E-Workspace

5.3.1 Analysis of Activities to Determine User Requirements

The conceptual model (as shown in Figure 5.1) indicates learning activities by students, which encompass the entire learning process throughout the Introductory to Philology course. The conceptual model focuses on the interactions amongst students, lecturers and related resources. The interviews, focus group discussions and observations help to ascertain the students' requirements.

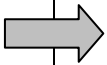
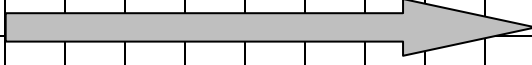
The learning process for students in the course depends on the lecturer. However, the students have simultaneous interactions with other people such as parents, siblings and friends that they can request for assistance. A number of students also seek assistance from other lecturers and librarians. However, the obvious flow of the students' learning process is that the students fully depend on their lecturer. Rather than learning through a holistic

approach, the students' learning manifests itself in the form of a transliteration process whereby students only gather data that they deem necessary.

The students' problems are mostly attributed to difficulties in searching for resources, Malay manuscript collections, lack of experts to whom they can consult to, as well as time. Since the main process of learning Malay manuscripts is through transliteration process, the students need to have good skills in conducting the transliteration work and they require experts to assist them.

Table 5.2 shows current activities involved in teaching and learning Malay manuscripts. From the interview session, Lecturer stated that the class activities are a cyclic process, and should be more than merely information gathering. The class activities should encompass “posing and identifying the question, exploring available information, refining the question, gathering and evaluating further information, as well as synthesizing, using and presenting it”. (Abd Rahim, 2000; Malaysia, Ministry of Education, 2006).

Table 5.2: Current Activities for Teaching and Learning Malay Manuscripts in JEEA3321 Course

Processes and Procedures	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14
Lecturer gives briefing on the assignment, give guidelines and requirements needed throughout the assignment process														
Lecturer lectures on Malay manuscripts														
Students are divided into groups and they select		●												

manuscript														
Students show the manuscripts to the lecturer for approval			●											
Students begin transliteration process														
Students conduct weekly presentations on their assignment progress														
Lecturer monitors students' progress during tutorial sessions														
Students submit their assignments											●			
Lecturer evaluates and grades students' works												●		
Students obtain the final grades after the examination week														●

At times, the students have no choice but to work on transliterated works or literary novels due to difficulties in searching for Malay manuscripts. A number of Malay manuscripts have restricted access and are viewable by the public. The lecturers interviewed in this study emphasized that the difficulties in acquiring Malay manuscripts from various resources lead to the presentation of stereotypical assignments and very few students produce assignments that fulfill the objectives of the Introductory of Philology course (Academy of Malay Studies Handbook, 2008).

Table 5.3 shows a list of modules that lecturers, students and researchers will be able to work within the Malay manuscript E-Workspace:

- (a) General functionality: This refers to the process performed by all users. After signing in, the users can set up their profiles and change user names and passwords. Group assignments can be carried out after creating a group. A function is provided where group members can be added, changed or removed. Guest ID will be given to those who are invited by lecturers or by request to the lecturers. Guest ID is

normally given to experts in Malay manuscript studies as well as the public with interest on Malay manuscript research.

- (b) Annotation Tools: This is basically a text editor equipped with flexible tools that allows users to perform group assignments concurrently. Users are given options when utilizing this tool. They are given options such as plain notes, export, all notes, research trail and view.
- (c) *MyManuskrip*: This refers to the main repository for Malay manuscript collections. All assignments are given using these collections, which can prevent students from choosing the same manuscript for assignment purposes.
- (d) Document Delivery: Students organize, prepare and submit their project reports online. All documents such as lecture notes and assignments can be uploaded into user accounts and can be reached whenever needed. This system supports all types of document formats.
- (e) Working with Group Members: A leader needs to be chosen in order to create a group. Group discussion tools such as chatting, messaging and annotation are provided.
- (f) Working with Lecturers: Students can interact with lecturers via forums. Students may ask questions privately or make the question accessible to the public in order to obtain responses, especially if they have a vague idea on the information they are looking for or have difficulties in formulating specific queries. Students often consult their peers to obtain references at the early stage. User documentation is prominent throughout the system although the system should be rather easy to use by anyone familiar with the Internet.

- (g) Glossary: Lecturers index the project and other digital resources to make the contents searchable and available to be used by students and other users.
- (h) Transliteration Tool: This is also a text editor, but it will be used in the final stage of the assignment. This produces a clean version of transliterated work.
- (i) Searching: Students in general perform searching (seek specific information) or browsing (navigate, whereby they expect to find topics available wherein some are useful information). These two features have to be supported by the E-Workspace. This means that students should be able to search and browse graded project reports from previous years. The system is browseable by collection types to inform students what is available on the topics. Students and lecturers should be able to perform simple search through a Google-type box for free-text searching although an advanced search would be desirable. The survey finds that the students are very familiar with Google, they employ a few search terms, rarely modify their queries, and rarely use advanced search features. The results are presented in a clean manner with a brief description of the digital content.
- (j) Submission and Grading System: The lecturers check the students' progress from time to time and keep track of students who have begun documenting their projects and those who have not. The lecturers evaluate and grade their students' projects online, and communicate the grades to students once the assignments are evaluated.

Table 5.3: List of Modules and Their Description

Module Name	Description
General Functionality	
Signing on and off	Username and password are given by the lecturer once user is enrolled to the course
Customizing your Sign On	Customize your sign on by creating your own user name and password. The username and password can be changed once you are successfully logged in for the first time
Using the Guest ID	This can only be used once you have been invited by the lecturer to join the class. It is usually be used for expertise or other lecturers who are invited by the lecturer in order to help students in doing their assignments
Setting up your Profile	Customize your profile settings to suit your needs, e.g. change profile picture, contact number and IM ID
Remove Member and Delete Team	Learn how to remove or change group members and delete group when assignments completed
Annotation Tools	
Automate the Updating of Your Assignment Progress	Use this tool to automatically receive assignment updates by other group members
Using Plain Notes	Want to retrieve entire annotated notes as one document? This tool shows how to view all annotated notes in plain document. This format can be used as one of the format for assignment submission purposes.
Using Export	Learn how to view all annotated notes with the original manuscripts in pdf format. This format can be used as one of the formats for assignment submission purposes.
Using All Notes	Learn how to view all annotated notes in table. This format can be used as one of the formats for assignment submission purposes.
Using the Research Trail	Learn how to use this productivity tool to track your annotated assignments, retrace your steps, or return to previous documents.
Using View Options	This tool allows user to view manuscripts and annotated notes in different views according to user preferences
MyManuskrip	
Navigating the <i>MyManuskrip</i> System Home Page	Familiarize yourself with various components of the <i>MyManuskrip</i> System Home page.
Searching All <i>MyManuskrip</i> Content	Looking for Malay manuscript to work on? You may want to search all <i>MyManuskrip</i> content. Download the manuscripts needed and upload them to the system before opening the manuscripts for students to view as assignment sources
Document Delivery	
Printing a Document or Result List	Learn how to print documents or a Result List. Printing options are also reviewed.
E-mailing a document or Result List	Learn how to e-mail documents or a Result List. E-mail options are also reviewed.
Downloading a Document or Result List	Learn how to download a document to your computer. Download options are also reviewed.
Working With Group Members	
Creating a Group	This option needs to be carried out in group assignments. A leader needs to be chosen in order to create a group while other group members simply need to join the group
Group Discussion: Annotation Tool	Annotate on the manuscript while discussing amongst group members
Group Discussion: Chat	Chatting amongst group members
Group Discussion: Personal Messaging	Send a message to group members or other group members

Working with Lecturers	
Get Enrolled	This will be notified through e-mails and students need to click the verification link to activate their accounts
Searching Manuscripts	Learn how to search, download, retrieve and upload Malay manuscripts that are chosen from <i>MyManuskrip</i> or other sources
Asking questions	All questions and comments can be sent out to lecturers through personal messaging
Assignment Submission	Submission is controlled by date and time that is set by lecturers
Getting Updates	Updates and other course materials will be shared in the main page of the course
Glossary	
Using the Table of Glossary	Learn how to find the meaning of words by keying in the words into the search box
Alphabetical Order	Learn how all the words are listed in alphabetical for easy retrieval
Limiting your Search	Learn how to use search preferences to narrow down your search to only those you required
Transliteration Tools	
Text Editor	This allows users to write 'clean' transliterated versions of manuscripts or copy and paste the transliterated manuscripts from the annotation tools to the text editor
Submission	Students can choose whether to submit the assignment to the lecturer using this tool or directly from Annotation Tool
Searching	
Tips for Searching – Part I: Choosing Search Terms	Learn how to choose the right search terms for your search
Tips for Searching – Part II: Constructing Complex Searches	Learn how to use connectors in your search to find the documents you need.
Determining your Best Search Method	Custom Search Template...Terms and Connectors searching...Natural Language searching. Learn the differences between these three search options and when is the best to use each method
Modifying a Search with Edit Search or Locate in Result	Review this module to learn what is the difference between editing your search and refining it with Locate in Result.
Linking to Related Information	Learn how to use the Related Info tab to retrieve related documents in <i>MyManuskrip</i> .
Submission and Grading System	
How to Create a Clean Assignment before Submission	User can choose to submit the assignments directly from the Annotation Tool or edit them using the transliteration tool before submission
Submission Feedback	Submissions will be sent to users individually including grades, marks and comments from the lecturers
User Report	This can only be viewed by lecturer where he/she can view the full record of students in a table
How to Create a Customized Report and Set it as Default	Review this module to learn how to customize your own usage report and set it as default with the Reporting System.

5.3.2 Malay Manuscript E-Workspace Programme Modules

Figure 5.2 portrays the services in terms of data transforming processes, described exclusively in terms of the definition of the programme modules. The three system modules, namely, lecturer, students and researchers provide different access types for different levels of users, as presented in the following sub-sections. Along with this are specific definitions for security requirements, in terms of who (which role) has permitted access to which function. A detailed description of the digital library modules is described in the following sub-sections.

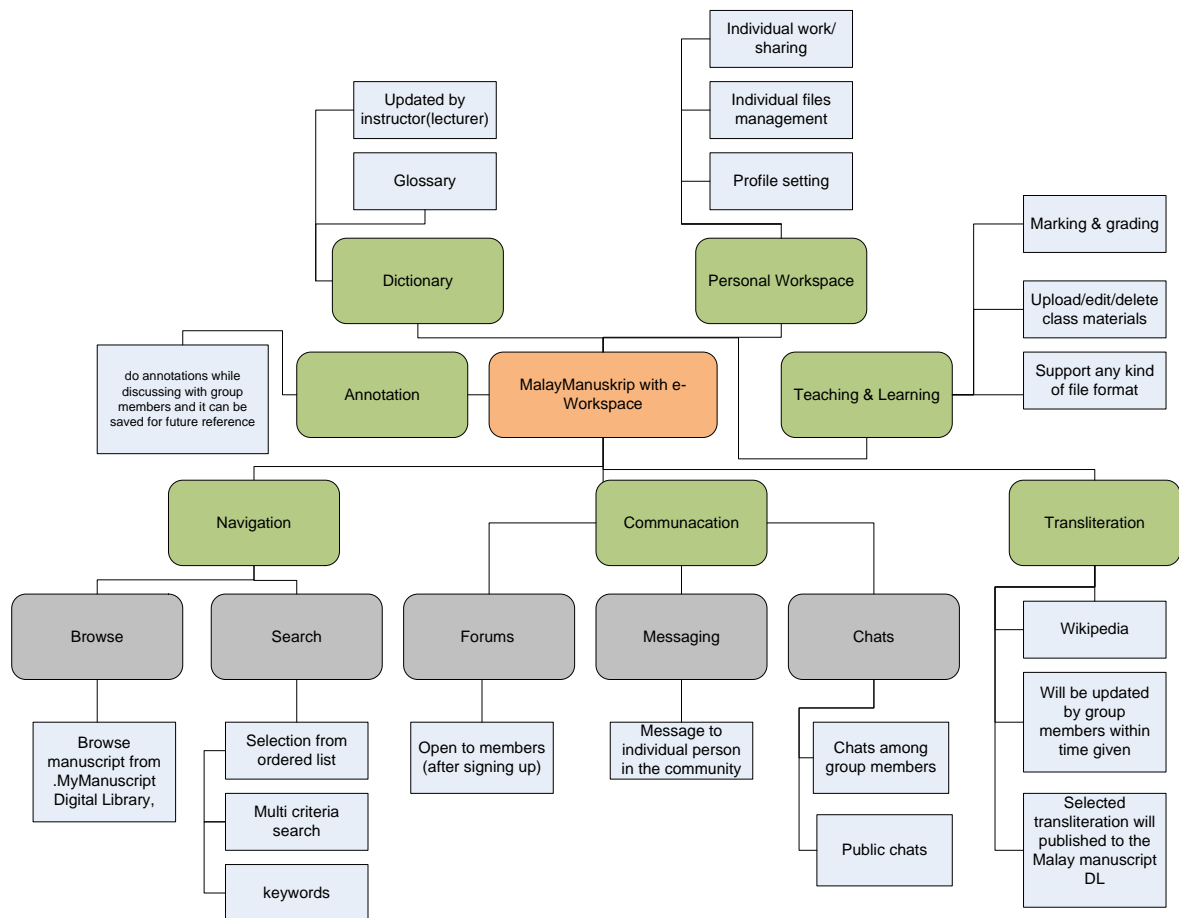


Figure 5.2: Services in Malay manuscript E-Workspace

(a) Lecturer Module

Lecturer is given authorization facilities as an administrator. Figure 5.3 presents the work flow diagram for the Lecturer module. Description of the Lecturer's menu is given in Table 5.4. The lecturer is the administrators for the E-Workspace system, and therefore the lecturer is in charge of maintaining the system and managing Malay manuscript collections. The lecturer provides access to all JEEA3321 course lecturers to perform the role as content reviewers and/or content access providers. In summary, the Lecturer module involves a) general functionality, b) *MyManuskrip*, c) document delivery, d) working with lecturers, e) glossary, f) searching and g) submission and grading.

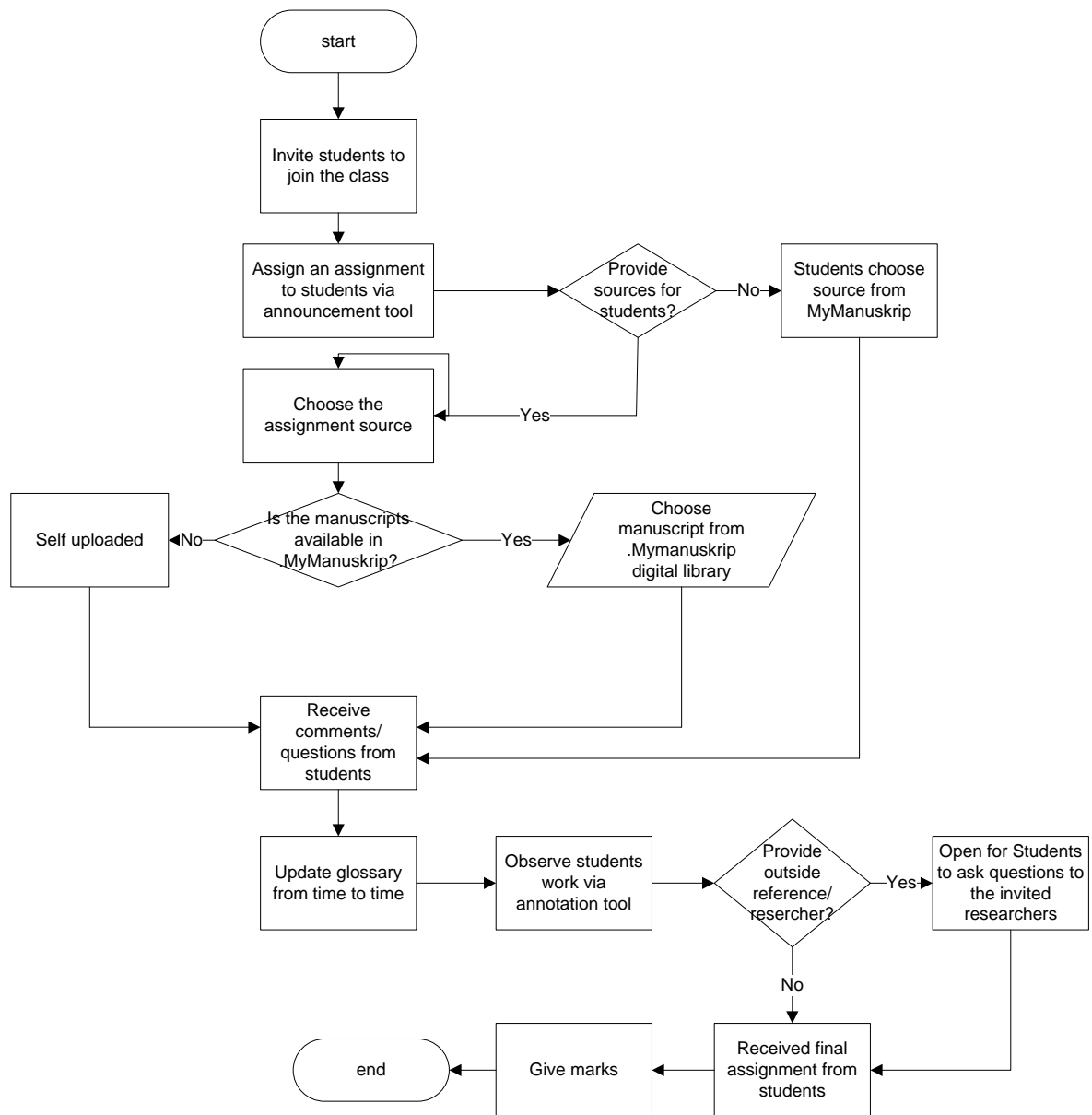


Figure 5.3: Work Flow Diagram of Lecturer Modules

Table 5.4: Detailed Functions of the Lecturer Menu

Modules	Menu Items	Sub-Menu Items	Description
General Functionality	Sign in	Customize sign in	Change username and password after successfully signing in for the first time
		Using guest ID	Provide guest id to other people to join the class
	Sign out	----	Allows lecturer to sign out
	Profile setting	Update profile	Update and delete existing profile
		View profile	View the profile after updating it
MyManuskrip	Browse	DBP Collections	Provide manuscript collections from DBP
		UM Collections	Provide manuscript collections from UM
		Published Collections	Provide manuscript collections from students' collection
		Other collection	Provide manuscript collections from other places
	Search	Quick search	Search by entering keywords
By collection		Search by choosing type of collection	
Document Delivery	Print	Quick Print	Print the selected document
		View	View document before printing
	Email	----	Email selected document to people in or outside the system
		Upload/Download	Lecture notes
	Assignments		Allows lecturer to upload assignments
	Other resources		Allows lecturer to upload relevant articles
	Manuscripts		Allows lecturers to download and upload manuscripts from MyManuskrip collections
Working with lecturer	Enroll	----	Give authentication to students to join the class
	Assignment	New Assignment	Upload new assignments
		Submission	Set date and time of assignment's submission
	Updates	----	Provide updates to students such as announcements and important tips
Glossary	Search	----	Search by keywords
	Update	----	Add new words
	Delete	----	Delete existing words in the glossary
Searching	Quick search	----	Key in any keyword and hit the search button
	Advanced search	----	Customize search by key in the title, author or date
	MyManuskrip	----	Search from MyManuskrip database
Submission and Grading	Settings	Date and time	Set date and time that alert students on assignment submission
	Grading	Review	Review and monitor submission for appropriateness (before the date of final submission)
		Submission feedback	Allows lecturer to mark and publish their student assignments
		User report	View and print students' report grade

(b) The Student Module

Figure 5.4 shows the work flow diagram for students that focuses on the activities performed by students, beginning with the sign-in process until obtaining the final grade from the lecturer. The module comprises of a) general functionality, b) Annotation Tool, c) *MyManuskrip*, d) document delivery, e) working with group members, f) working with lecturers, g) glossary, h) Transliteration Tool, i) searching, j) submission and grading. Description of each menu and sub-menu is detailed in Table 5.5.

The transliterated works are candidates for addition to *MyManuskrip*. The transliterated works will be selected by lecturers during the grading process, and the goal is to enable students to contribute to the *MyManuskrip* collections under the “Published Collections” tab. The E-Workspace supports two authoring tools i.e. Annotation and Transliteration tools. The Transliteration Tool is basically a text editor that allows students to compile all transliterated works accompanied by analyses, whereas the Annotation Tool support live-discussions while doing assignments. The Transliteration Tool has the following features:

- (a) Wikipedia features where students can edit text from time to time
- (b) Details on each update, i.e. name, time and date of update
- (c) Create callouts to make conversation on selected lines of manuscript
- (d) Highlight, bold, and italicize the text
- (e) Offers options to display the assignment contents i.e. plain notes, export, all notes, and research trail.
- (f) Preview the manuscripts and annotated assignments.
- (g) Editing of assignments according to lecturer’s comments before final submission.



Figure 5.4: Work Flow Diagram of Student Module

Table 5.5: Detailed Functions of the Student Menu

Modules	Menu Items	Sub-Menu Items	Description
General functionality	Sign in	----	Allows students to sign in into the system
		Customize sign in	Change the username and password after successfully signing in for the first time
	Sign out	----	Allows students to sign out
	Profile setting	Update profile	Update and delete existing profile
		View Profile	View the profile after updating it
	Member	Add	Add or change new member into the group
		Remove	Remove group members and delete the group when the assignment is completed
Annotation Tool	Find	----	Allows students to search for assignment by keying in keywords
	Properties	----	Provide details about the viewed manuscript
	Clipboard	----	Allows the process of ‘copy’ and ‘paste’ of text in the original manuscript onto the clipboard
	Colours	----	Provide multiple colours to choose for dialogue boxes and notes
	Plain notes	----	Show all annotated works together with details. Can be used as one of the option on submission form
	All notes	----	Show all annotated works in table
	Export	----	View in pdf format
<i>MyManuskrip</i>	Browse	DBP Collections	Provide manuscript collections from DBP
		UM Collections	Provide manuscript collections from UM
		Published Collections	Provide manuscript collections from students’ Collections
		Other Collections	Provide manuscript collections from other places
	Search	Quick search	Search by entering keywords
		By Collections	Search by choosing type of collection
Document delivery	Print	Quick Print	Print the selected document
		View	View documents before printing
	Email	----	Email selected document to people in or outside the system
		Upload/Download	Lecture notes
		Assignments	Allows students to upload assignments
		Other resources	Allows students to download relevant articles
Working with group members	Creating a group	Create	Create a group by choosing a leader and the leader needs to create a group (one time only)
		Join	Allows students to join the group
	Group discussion	Annotation tool	Allows annotation on the manuscript while discussing with group members
		Chat	Allows chatting amongst group members
		Personal messaging	Allows personal message to be sent amongst group members or to students in other groups
	Updates	----	Receive updates from lecturer in the form of announcement or important tips
Working with lecturers	Enroll	----	Allows students to join the class for the first time
	Assignment	New assignment	Receive new assignment from lecturer through notification
		Submission	Obtain notification from lecturer on date and time of assignment submission
Glossary	Search	----	Search by keyword

Transliteration Tools	Text editor	----	Allows user to write ‘clean’ transliterated works
	Submit	----	Allows completed assignment to be submitted to lecturer
Searching	Quick search	----	Key in any keyword and hit the search button
	Advanced search	----	Customize search by keying in the title, author or date
	<i>MyManuskrip</i>	----	Search from <i>MyManuskrip</i> database
Submission and Grading	Submission	----	Submit the assignment directly from the Annotation/Transliteration tool or upload from local drive
	Grading	Marks	Receive marks from lecturer
		Report	View the report grade

The latter supports uploading of assignments and presentations, which may incorporate one or more types of multimedia content. For example, a lecturer wants to upload a scanned photograph of the manuscript personality and a scanned copy of an old Malay manuscript. Submission tools support the creation of a description portion for the works by contributors. At the end of the semester, after all students have received their marks and comments for their assignments, all submissions will be subjected to the lecturers’ review and acceptance before they are incorporated into the *MyManuskrip* collection to be viewed by all users. This is due to concerns regarding the quality or relevancy of the students’ transliterated works as well as quality of object descriptions.

(c) Researcher Module

The Researcher module provides the following functions: (a) general functionality, (b) Annotation Tool, (c) *MyManuskrip*, (d) document delivery, (e) working with group members, (f) glossary, (g) Transliteration Tool, and (h) searching. This module is similar to the Student module, with the absence of interaction with lecturers as well as submission and grading system. Researchers refer to the general public who are carrying research in Malay manuscript studies and they use the E-Workspace system as a tool to manage and organize their research. This system helps them to collaborate with others who are using the

system. Researchers may use the E-Workspace as an individual researcher or as a group. In the JEEA3321 course, the students and lecturer utilize *MyManuskrip* as the main manuscript resource. However, for researchers, this repository can be referred as an alternative for Malay manuscript collections.

Researchers may be invited by lecturers and are given a guest ID. Several researchers are invited into the course as experts whom the students can refer to if they need help regarding their assignments. The researchers are usually involved in class activities, such as forums and Q&A sessions. From the data collected, the researchers from the Academy of Malay Studies, University of Malaya, stated that they need to refer to dictionaries and experts in Malay manuscript studies during the transliteration process in order to produce exceptional transliterated works. Therefore, they perceived that tools such as glossaries may greatly facilitate them in transliteration works. Similar to the Student module, researchers who work in groups can participate in the E-Workspace, conduct discussions and they may opt for public or private appearance. Researchers can also contribute their works to the *MyManuskrip* collection by submitting their works to the lecturer, who administers the system. In the E-Workspace, the lecturer is the person solely responsible for updating the *MyManuskrip* collections.

A value added function to the E-Workspace is an interface that changes according to special and important events. This interface is controlled by the lecturer. For example, the main interface displays that a conference on Malay manuscripts is going to be held soon. The E-Workspace can be defined as a collaborative system that unites the whole Malay manuscript community. Figure 5.5 presents the features under the Researcher module and Table 5.6 tabulates the description of the Researcher menu.

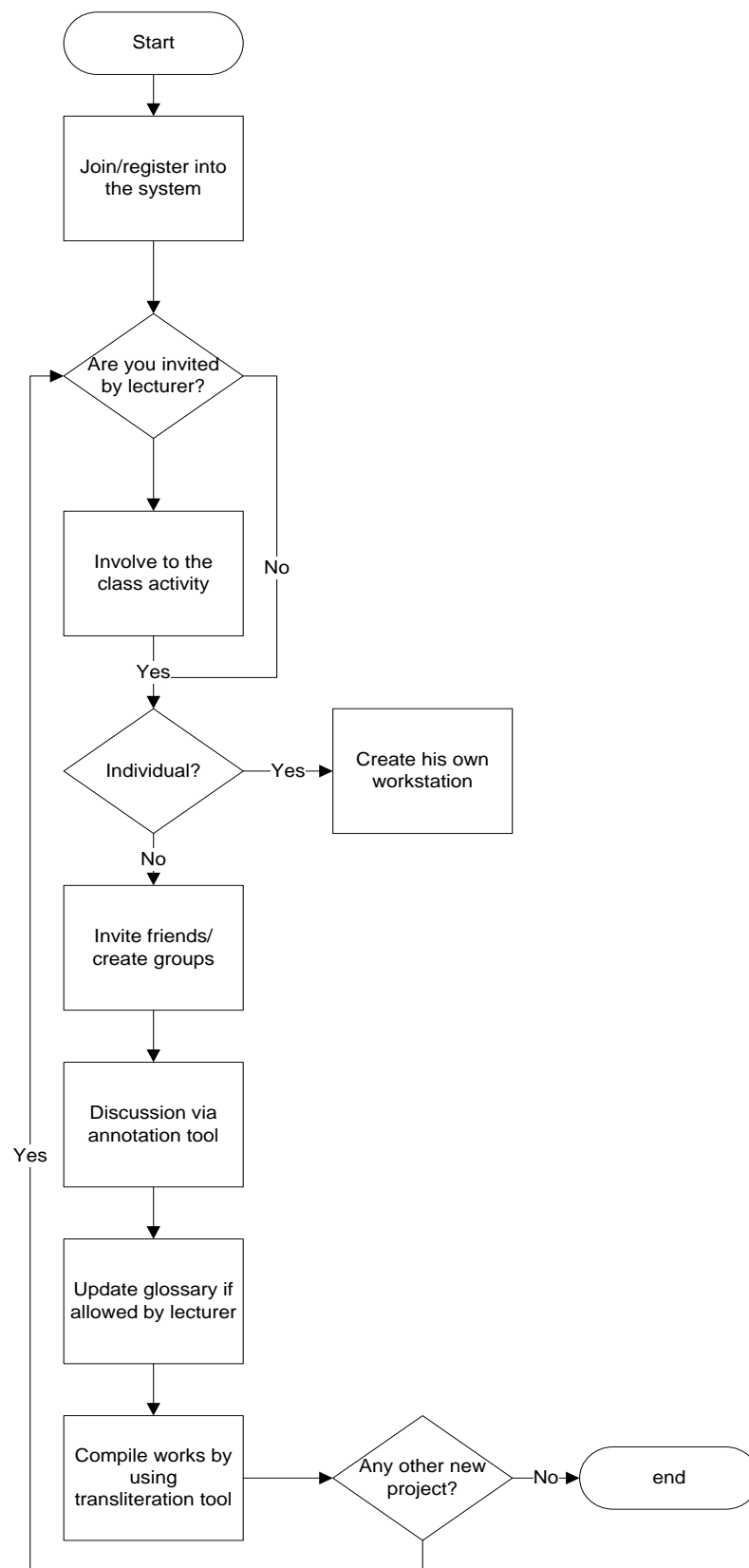


Figure 5.5: Work flow diagram of Researcher modules

Table 5.6: Detailed Functions of the Researcher Menu

Modules	Menu Items	Sub-Menu Items	Description
General functionality	Sign in	Customize sign in	Change username and password after successfully signing in for the first time
		Using guest ID	Sign in by using guest ID given by lecturer
	Sign out	----	Allows lecturer to sign out
	Profile setting	Update profile	Update and delete existing profile
		View Profile	View profile after updating it
	Member	Add	Add or change new members into the group (if they are in group)
		Remove	Remove group members and delete the group when the assignment is completed (if they are in a group)
Annotation Tool	Find	----	Allows researcher to find annotated documents by keying in keywords
	Properties	----	Provide details regarding the viewed manuscript
	Clipboard	----	Allows the process of ‘copy’ and ‘paste’ text in the original manuscript onto the clipboard
	Colours	----	Provide multiple colors to choose for dialog box and color for notes
	Plain notes	----	Show all annotated works together with the details. Can be used as one of the option on submission form
	All notes	----	Show all annotated works in table
	Export	----	View in pdf format
<i>MyManuskrip</i>	Browse	DBP Collections	Provide manuscript collections from DBP
		UM Collections	Provide manuscript collections from UM
		Published Collections	Provide manuscript collections from students’ collection
		Other Collections	Provide manuscript collections from other places
	Search	Quick search	Search by entering keywords
		By Collections	Search by choosing type of collection
Document delivery	Print	Quick Print	Print the selected document
		View	View document before printing
	E-mail	----	E-mail selected document to people in or outside the system
	Upload/Download	Assignments	Allowss researcher to download their works
		Other resources	Allows researcher to download relevant articles
Working with group members (optional)	Creating a group	Create	Create a group by choosing a leader and the leader needs to create a group (one time only)
		Join	Allows other members to join the research group
	Group discussion	Annotation tool	Allows annotations on the manuscript while discussing with group members
		Chat	Allows chatting amongst research group members
Glossary	Search	----	Search by keywords
Transliteration Tool	Text editor	----	Allows researcher to write down ‘clean’ transliterated works
Searching	Quick search	----	Key in any keywords and hit the search button
	Advanced search	----	Customize search by keying in the title, author or date
	<i>MyManuskrip</i>	----	Search from <i>MyManuskrip</i> database

5.4 Scope and Limitations

The Introduction to Philology course is chosen as the domain for the E-Workspace system development indicated in Chapter 4. Students in the interviews and focus group discussions mostly narrate examples of searching for information on Malay manuscript collection using the Internet, although they are unaware of the existence of the digital library for Malay manuscripts (*MyManuskrip*). As such, it is assumed that using Internet as a medium for learning and collaborations will greatly benefit the students. Hence, the E-Workspace is conceived and is constructed to fulfill the needs to support teaching and learning Malay manuscripts for JEEA3321 students.

This study primarily focuses on the process of teaching and learning Malay manuscripts by using a Malay manuscript E-Workspace as a platform to perform collaborative transliteration assignments using manuscript resources in a digital library (*MyManuskrip*) amongst students and researchers in Malay philology studies at APM, University of Malaya. In summary, this study shows the process and issues related to teaching, learning and researching Malay manuscripts. The process and issues are captured and depicted in a rich picture, based on three different views of stakeholders:

- (i) Lecturers mainly use the “chalk and talk” approach when delivering their course, and they refer students to a single reference throughout the course (Ghani et al., 2009). The lecturers emphasize that students must be able to read *Jawi* in order to study the course due to the fact the main assignment involves transliterating old *Jawi* scripted text into modern Romanized Malay. The lecturers would like to have access to more Malay manuscripts that can be utilized by their students in their assignments.

- (ii) The students confirm that their main assignments involve transliteration work and their main source of reference is their lecturer. They are unaware of the existence of a digital library for Malay manuscripts and show willingness to access online manuscript resources, carry out online discussions with their lecturers and peers for their assignments.
- (iii) Researchers use printed text for their research, and they mainly use computers for word-processing. They feel that online classical Malay dictionaries will greatly assist them in their research.

These issues are therefore used as a set of general guidelines for developing the E-Workspace. Based on the data collected, the Malay manuscript E-Workspace should be as follows:

(a) Subject

- The Malay manuscript resources collected are intended to fulfill the subject scope(s) of the collections.
- The Malay manuscript resources collected should be well-designed, readily usable and available to the target audience(s) of the collection.
- Malay manuscripts that may be useful for the target audience (although deviated from the subject scope of a given collection) may be included.
- Documents and resources on teaching and learning techniques, assessment instruments and other materials to help support the use of Malay manuscripts in the collections may be included.
- The contents of the Malay manuscripts should be generally error-free.

(b) Language

- The primary language of the students' project reports is Malay.
- The languages of the collections are *Jawi* and Romanized Malay.
- The primary language of the metadata describing the resources is Malay.
- The metadata standard for the collection also enables for resources and metadata to be described in Malay.

(c) Time Scope

- The Malay manuscript collections will contain materials that are generally readily available and freely accessible to the audience.

(d) Geographical

- The resources in the Malay manuscript collections are primarily from and for use within Malaysia.
- Worldwide resources are included in the collection if they meet the subject scope(s) and needs of the Malay manuscripts collections' target audience(s).

(e) Diversity

- The resources in the collections will, to the extent possible, reflect cultural diversity or exhibit cultural neutrality.
- Special emphasis will be placed on resources that provide positive images and role models in Malaysian history.

5.5 Summary

Chapter 5 presents conceptual model for teaching, learning and researching Malay manuscripts that is then used to model a development of the E-workspace. The Malay manuscript E-Workspace consists of ten modules which offer a digital platform to facilitate teaching, learning and researching manuscripts activities among paleographers. The following chapter discusses the next phase of SSM which include comparing the conceptual

model to the current problem situation (the manuscript studies), identifying changes that should be made and making improvements.

CHAPTER 6

COMPARING, IDENTIFYING AND MAKING CHANGES: PHASE 4 AND PHASE 5

6.1 Overview

This chapter discusses on the fourth and fifth phases of the research work according to the stages 5, 6 and 7 of SSM. The fourth phase compares the current process in manuscript studies and the proposed E-workspace as a solution (stage 5 of SSM). This is then followed by a usability testing to identify the feasible, desirable changes needed and propose solutions to rectify the problems (stage 6 and 7 of SSM). The usability testing is conducted amongst potential users of the Malay manuscript E-Workspace. The resulting conceptual model is not representative of the so-called real world situation but is a depiction of a more effective way of achieving the desired objectives. Within the SSM, comparisons are made through the use of tables or lists to ease the process of comparing and contrasting.

6.2 Comparing the Current Situation (the process of Malaya manuscript studies) with the Proposed Solution (the E-Workspace)

Stage 5: Comparing the Current Situation with the Proposed Solution

This stage compares the conceptual model with the current system that identifies the desirable and feasible changes needed, as shown in Table 6.1.

Table 6.1: Comparison between the Current Situation and Proposed Solution

Stakeholders	Current Situation	Proposed Solution
Lecturer	<ul style="list-style-type: none"> ▪ Use chalk and talk as the delivery method for philology and transliteration. ▪ Could not locate references on transliteration work. ▪ Could not identify philology experts to collaborate with. ▪ Insufficient time to teach transliteration (confined to 2 hours of lecture a week for 14 weeks). ▪ Insufficient time to give consultation to students to help solve their transliteration problems (confined to 1 hour tutorial a week for 14 weeks). ▪ Could not locate original Malay manuscripts for students' assignments on transliteration. ▪ Lack preservation initiatives for existing printed manuscripts. ▪ Unaware of the existence of digital resources for Malay manuscripts. 	<ul style="list-style-type: none"> ▪ Experience teaching in an electronic environment. ▪ Upload and update course syllabus and learning materials 24/7 ▪ Conduct online discussions with students, other lecturers, experts (in Malaysia and abroad), and researchers 24/7. ▪ Use online Transliteration Tool for teaching. ▪ Assign transliteration work online to individuals/groups of student. ▪ Assess students' work online and provide timely feedback. ▪ Annotate manuscripts and share with students, other lecturers and researchers. ▪ Access digital collection of Malay manuscripts 24/7. ▪ Invite experts/philologists to join the manuscript community for research collaborations.
Students	<ul style="list-style-type: none"> ▪ Are not provided with proper syllabus or course contents. ▪ Difficulties in locating the original printed Malay manuscripts – use printed copies from lecturers/library ▪ Transliteration assignments are based on manuscript transliterated by previous students –causing duplication of the same title. ▪ Insufficient time to conduct group discussions as this can only be done face-to-face ▪ Must be <i>Jawi</i> literate in order to complete transliteration work ▪ Unaware on the existence of digital resources for Malay manuscripts ▪ Students are over-dependent on lecturer for course materials and resources ▪ Lecturers refer to only one textbook on transliteration work, which is inadequate. ▪ Insufficient time to learn and consult lecturer regarding transliteration work (confined to 3 hours lecture & tutorial sessions a week for 14 weeks) ▪ Difficulties in meeting lecturers face-to-face for advice and consultation on transliteration out of the lecturer's tutorial sessions 	<ul style="list-style-type: none"> ▪ Learning materials, course syllabus are accessible 24/7. ▪ Conduct online discussions and consultations with lecturer and course mates. ▪ Use online Transliteration tool 24/7. ▪ Annotate manuscripts and share them with course mates and lecturers. ▪ Browse collections of digitized manuscripts in digital libraries in Malaysia and abroad. ▪ Use new digital surrogates of manuscripts from digital libraries and repositories for transliteration assignments.
Researcher	<ul style="list-style-type: none"> ▪ Difficulties in locating the original printed Malay manuscripts for research 	<ul style="list-style-type: none"> ▪ Access digital collection of Malay manuscripts 24/7

	<ul style="list-style-type: none"> ▪ Could not locate references to refer to – e.g. dictionaries, theses and journal papers ▪ Unaware of the existence of digital resources for Malay manuscripts ▪ Require dictionary support for transliteration work ▪ Difficulties to find philology experts to refer to and consult. 	<ul style="list-style-type: none"> ▪ Upload and update additional references 24/7 – e.g. glossary ▪ Use online Transliteration tool for research purposes 24/7 ▪ Conduct online discussions with researchers 24/7 ▪ Annotate manuscripts and share them with other researchers ▪ Invite other experts/philologists to join the manuscript community for research collaborations
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Stage 6 and 7: Feasible, Desirable Changes Needed and Action to Rectify the Problems

These two stages implement all the changes that have been identified. The rich picture is re-designed into a conceptual model, as shown in Figure 6.1. This framework which proposes that the process of teaching, learning and researching Malay manuscripts should be carried out in a digital environment in order to solve the issues and problems that have been identified in the current system. The details on the desirable changes that should be undertaken are analyzed, followed by the actual implementation of the digital library. The provision of an online platform to support teaching, learning and research activities and the use of resources from *MyManuskrip*, is generally welcomed by philology lecturers, students and researchers at the Academy of Malay Studies, University of Malaya. Specifically, the modules proposed should support transliteration and annotation activities, use current digital manuscript resources from *MyManuskrip*, allow lecturers to upload their syllabus and teaching resources, support interactivity in terms of student-lecturer and student-student discussions, uploading transliterated assignments as a collection in *MyManuskrip*, and the provision of a dictionary of terms to assist manuscript researchers. Generally, the

proposed system should be able to support discussions and sharing of knowledge while promoting the use of Malay Manuscripts to a wide audience.

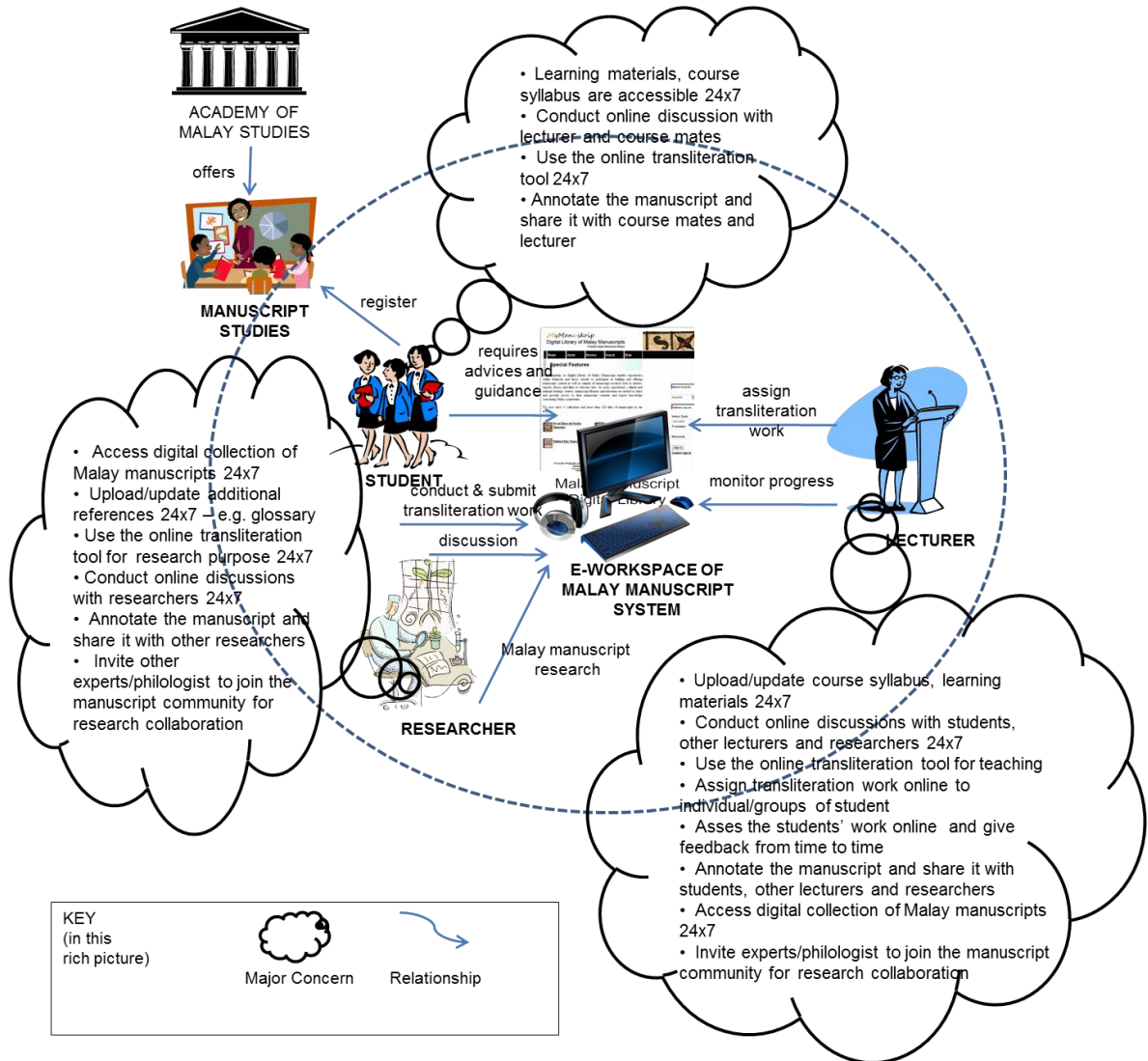


Figure 6.1: Conceptual Model of Malay Manuscript E-Workspace

6.3 Usability Testing

This study incorporates the users' assessment of the Malay manuscript E-Workspace prototype in order to evaluate the viability and usefulness of the system. Usability testing is vital in order to show that the motivation to use, major goals and objectives, and the functional requirements identified during the data collection process are achieved, as well as to achieve the fifth objective of this study, which is to evaluate the readiness of the philological community to utilize digital library with services for teaching, learning and research. This involves carrying out tests to determine the acceptance of the digital library system by potential users.

Although the pilot study reveals that users are able to use the system in its intended manner, there are several arising issues which need to be resolved before proceeding to the final experiment. These issues are predominantly related to the interface, such as the overall background colour, font and images used in the system. In addition, time lags are associated with the use of several tools, and therefore numbers of interfaces are modified to facilitate identification of the component which they represent. The lagging time issues are believed to occur due to the local server currently used for pilot testing, whereas the lengthy time for downloading manuscript collection depends on the size of manuscripts. A number of manuscripts exceed 100 pages, which are definitely time-consuming for downloads.

The following sections present the results obtained from the two phases of usability testing. In the first phase, participants are required to complete the tasks given and the second phase involves focus group discussions.

6.3.1 Background of the Test

The *MyManuskrip* E-Workspace was originally developed to support the needs of the Malay manuscript community in the process of teaching, learning and researching Malay manuscripts. The E-Workspace consists mainly of the Transliteration module where users can perform transliteration work individually or collaboratively by annotating the manuscripts in electronic form while conducting real-time discussions simultaneously.

Students and lecturers can use the Annotation tool for their transliteration works in the *MyManuskrip* E-Workspace, whereby they can annotate and participate in group discussions with peers and lecturers in real-time, as well as other manuscript experts who join the community (see Figure 6.2 and Figure 6.3).

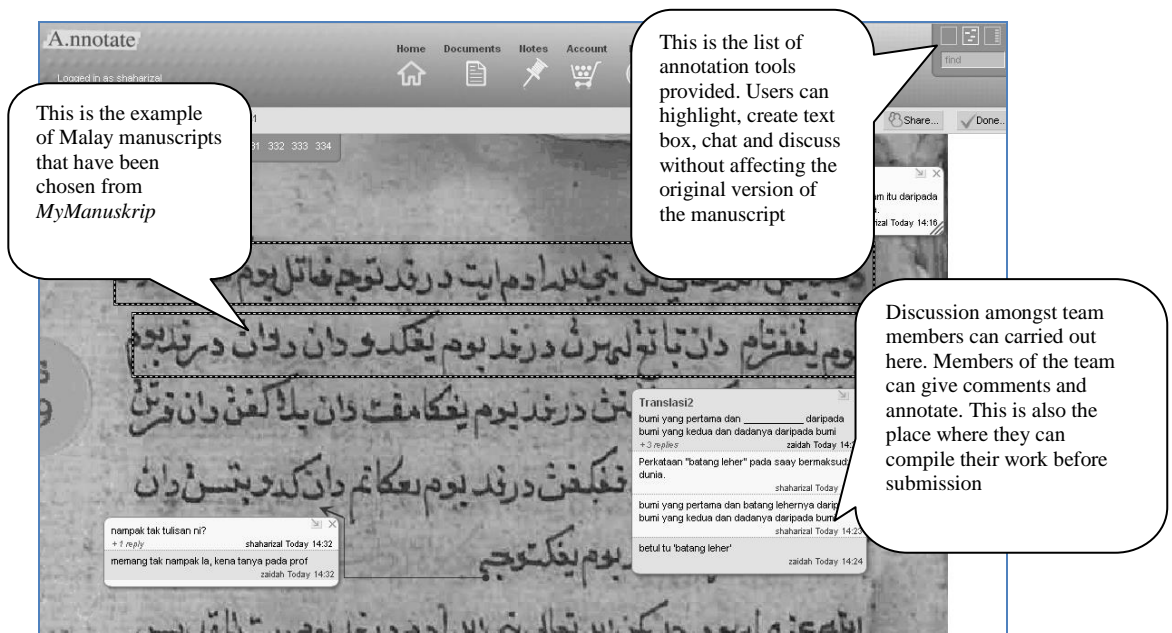


Figure 6.2: Annotation Module

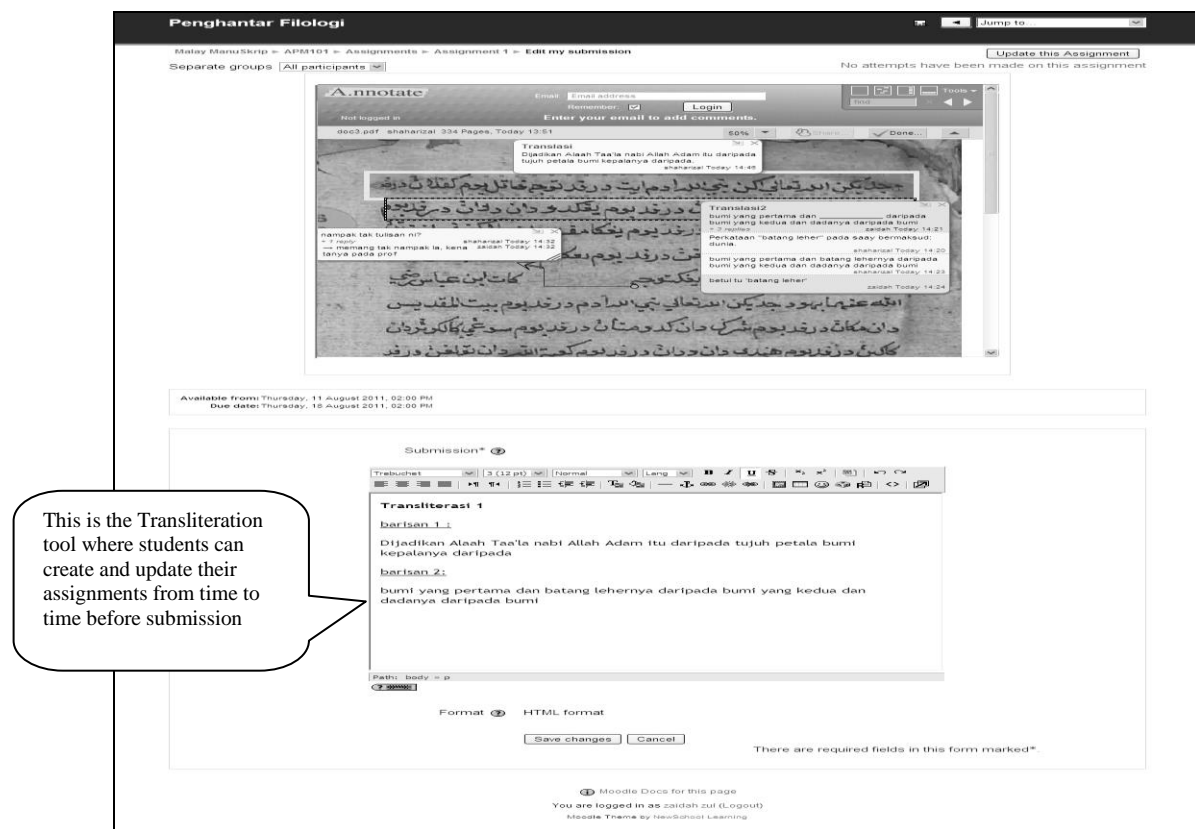


Figure 6.3: Transliteration Module

The purpose of system usability is to identify problems and recommend improvements on the utilities of a product during its design and development. The system usability testing is conducted in three phases. According to Nielsen (1993), he proposes “discount usability” which holds that when the number of test users is limited, it is important to ensure that the participants are representative of the expected user group. In order to achieve the discount usability, the participants for the usability testing are selected based on the suggestion from the APM, which are people who are experienced in the Malay manuscripts study. The first phase is focused amongst researchers which are currently doing research in Malay manuscript studies. Phase 2 is focused on students with experience attending Malay manuscript courses while Phase 3 is targeted on lecturers teaching Malay manuscript courses.

6.3.2 Tasks and Questions

(Refer to **Appendix F & Appendix G** to see the tasks and questions). In order to examine the needs of the Malay manuscript community in teaching, learning and researching and how a collaborative workspace might be designed to meet these needs, the Soft Systems Methodology (SSM) developed by Checkland (1993) is used to investigate the user requirements on using the digital content of *MyManuskrip*. This is carried out by examining current practices, observing behaviour and identifying the problems faced by the community, which involve lecturers, students and researchers as the major stakeholders. SSM is a generic model used to investigate problem situations in a variety of organizations such as to facilitate class review sessions, digital library projects (Zainab, Abrizah & Mohd Hilmi, 2009), information system development (Rose, 2002; Somerville & Brar, 2009), library management and information services (Delbridge & Fisher, 2007; Delbridge, 2008) and information literacy (Nor Edzan, 2007). This study is carried out in accordance with the seven stages of SSM:

- a) Identify and declare the problem situation (Stage 1 and 2),
- b) CATWOE analysis (Stage 3),
- c) propose conceptual model (Stage 4),
- d) compare the current situation and the proposed solution (Stage 5),
- e) develop and evaluate the solution (Stages 6 and 7).

Assessment of the E-workspace usability involves user evaluation testing that is conducted to identify system performance, user acceptance and functions that require improvements. Evaluation is measured based on five usability dimensions, namely, efficiency,

effectiveness, engagement, error tolerance and ease of learning (Quesenbery, 2003). Table 6.2 elaborates on the definition of each dimension. User evaluation is carried out in two phases. In the first phase, the participants are given several tasks to perform while using the *MyManuskrip* E-Workspace. This method is proposed by Chapanis (1991), in which the participants are given several tasks to perform in a defined set of environments. Therefore, the participants (students and researchers) are gathered in a digital library research laboratory at the Faculty of Computer Science and Information Technology, University of Malaya and are requested to use the *MyManuskrip* E-Workspace to complete a set of tasks within an hour while for lecturers, the tasks given was held in their office individually. Three separate sessions are held for evaluation. The first session comprises of eight students (assigned code UTS1- UTS8) who have attended the “Introduction to Philology” course, and have agreed to participate in the *MyManuskrip* E-Workspace project. The second session consists of eight researchers (assigned code UTR1 – UTR8), all of whom are undertaking their Masters or Ph.D research programme at Academy of Malay Studies while the third session consists of three lecturers (assigned code UTL1 – UTL3), who have taught the “Introduction to Philology” course.

Table 6.2: The Description of the Usability Dimension

Usability Dimension	
Effectiveness	The completeness and accuracy with which users achieve their goals
Efficiency	How quickly and directly users can complete their goals
Engagement	The degree to which system interface is pleasant, satisfying and enticing to use
Error Tolerance	How well the Workspace design could prevent errors, or provide assistance for recovery by providing information, selections of actions to correct the problem, or other solutions
Ease of Learning	How well the workspace supports initial use and extension for deeper understanding

For a given task, the participants (students and researchers) are requested to perform a transliteration work in a group. The users are directed on how to create a group, invite people to join the group, browse and search the digital library to select a manuscript. This module requires participants to complete a transliteration task in a group to demonstrate that the system can support an online collaborative platform when undertaking assignments and doing research on Malay manuscripts. Using the workspace, each group member can annotate the manuscript chosen from *MyManuskrip*, and participate in real-time discussions while performing transliteration works online. The final transliteration is then compiled and submitted to the system for the lecturer to review (in the case of student assignments) or to be viewed by other researchers.

Each participant logs in using his or her own username and password. They are given 15 minutes to explore the prototype. Following this, the participants are specifically instructed to search and browse *MyManuskrip* and perform the tasks given. Students and researchers in both sessions are requested to:

- (1) Create a new assignment type, “group assignment”;
- (2) Create a name for the group. Students can assign descriptions for the type of work to be undertaken by the group. Respondents can see members who are assigned to the group by their lecturers. This means that a student can be a member of only one group.
- (3) Register as a member to an existing group. This is possible only if group memberships are still open. Once group membership is marked closed, the addition of new members is disabled.

- (4) A group leader can be assigned by the lecturer or elected by members. Once the participant is assigned as the group leader, the leader can remove a member from the group.
- (5) Each group member can upload or remove a manuscript into or from the Workspace and this file can be viewed by all members.
- (6) By using the Transliteration and Annotation tools, each member can add, edit, delete or annotate a chosen manuscript downloaded from the manuscript digital library into the Workspace. The final transliteration is compiled using a text editor and submitted for marking by the lecturers.
- (7) The lecturer can view all members of a group and assign marks for submissions.

While lecturers are requested to:

- (1) Log in as a lecturer by using given user name and password
- (2) Click “turn editing on” tab in order to act as an administrator of the system
- (3) For this usability testing purposes, lecturers are required to add a new course as “Pengantar Filologi”
- (4) After entering the course, lecturer can add a resource such as sharing information and upload the assignments.
- (5) To upload a new manuscript, lecturer is required to share the link if the manuscripts are available online or upload the manuscript from the local driver in their PC. Then, name the manuscripts and the description.
- (6) Lecturer see the notifications every time students send personal messages and also if students do the assignment submission.
- (7) Give comment and grade to students

The second phase of user evaluation involves focus group discussions, in which the participants are interviewed to elicit their feedback on the system's performance after they have completed the given tasks. (See Appendix H for Malay Manuscripts E-Workspace System Documentation).

6.3.3 User Feedback on Overall System Operation

This section provides the feedback from the students (UTS1 – UTS8), researchers (UTR1 – UTR8) and lecturers (UTL1 – UTL3) after they have completed the assigned tasks. The feedback is given in verbatim statements to emphasize the findings. The findings indicate a positive reaction from the participants towards the Workspace, with the highest average of 87.5% on effectiveness, followed by 75% on error tolerance, 68.8% on engagement, 56.3% on ease of learning and 31.3% on efficiency. Figure 6.4 shows the main page of the Malay manuscript E-Workspace.

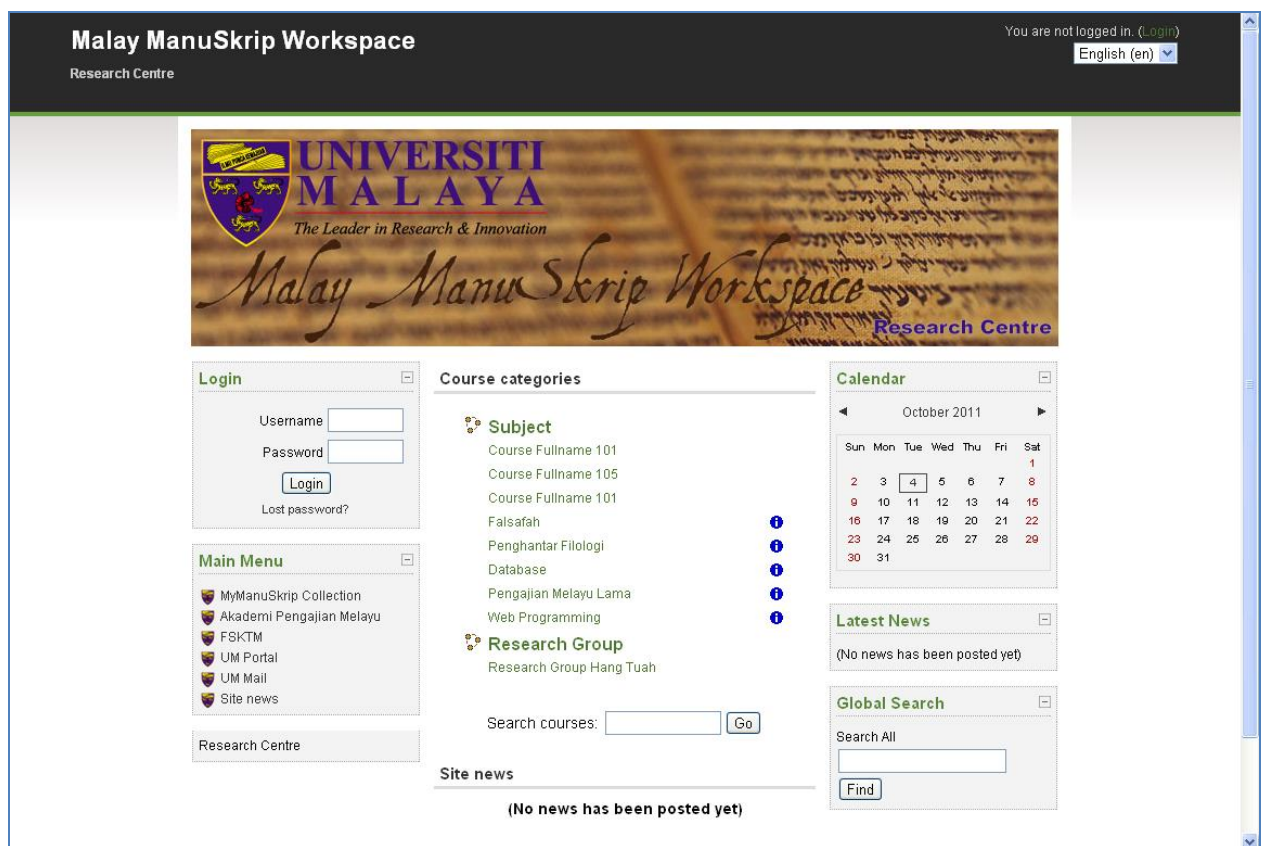


Figure 6.4: Main page of the Malay manuscript E-Workspace

6.3.3.1 User Feedback on Effectiveness

Effectiveness refers to the completeness and accuracy in which users can achieve when completing the main tasks in transliterating manuscripts. When carrying out the given tasks, the users are observed to be able to successfully and correctly complete the transliteration tasks. The *MyManuskrip* E-Workspace provides several options for users to view the manuscript collection conduct transliteration and submit transliteration works. Figure 6.5 shows the process when lecturer uploads the transliterated work done by the students. The students find that these options are flexible. One user (UTS6) positively comments, *“Honestly, I am currently using an e-learning system called SPECTRUM which is merely*

used for downloading lecture notes. I never can imagine that this system (MyManuskrip E-Workspace) is far different and offers more than that” (UTS6).

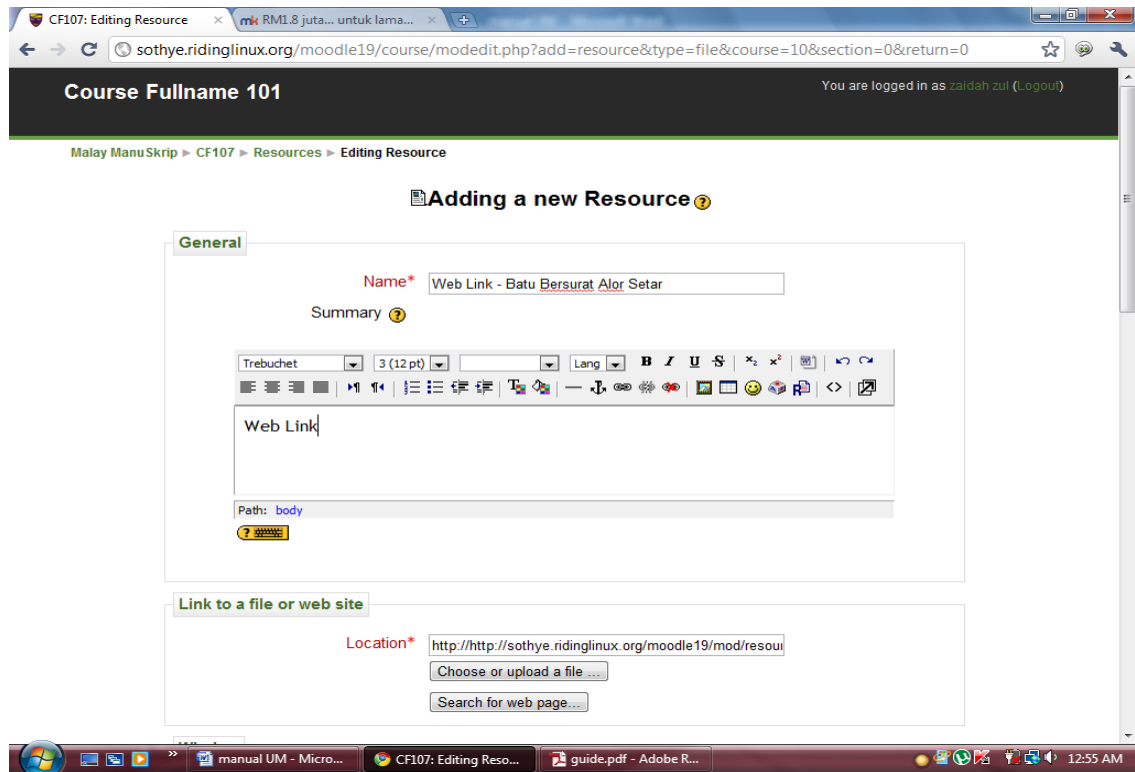


Figure 6.5: Main Interface Where a New Transliterated Work Is Shared In the Existing Collection

In addition, a researcher (UTR1) adds, *“It’s a good effort to share these manuscripts since it is not easy to find them especially old collections. Last time we lost many precious of Malay manuscripts when the library was flooded and we don’t want the same thing to happen again”* (UTR1). Figure 6.6 shows the interface after logging-in to the E-Workspace, and there is a direct link provided to the *MyManuskrip* collections as shown in Figure 6.7.

A lecturer responds that, *“I did enjoyed doing the transliteration task, especially when I can refer to the electronic classical Malay dictionary while I’m doing the transliteration”* (UTL-1). Transliteration module offers groups work while provides an electronic classical Malay dictionary for users to refer while doing their works. The contents of the dictionary are updated by the lecturer from time to time.

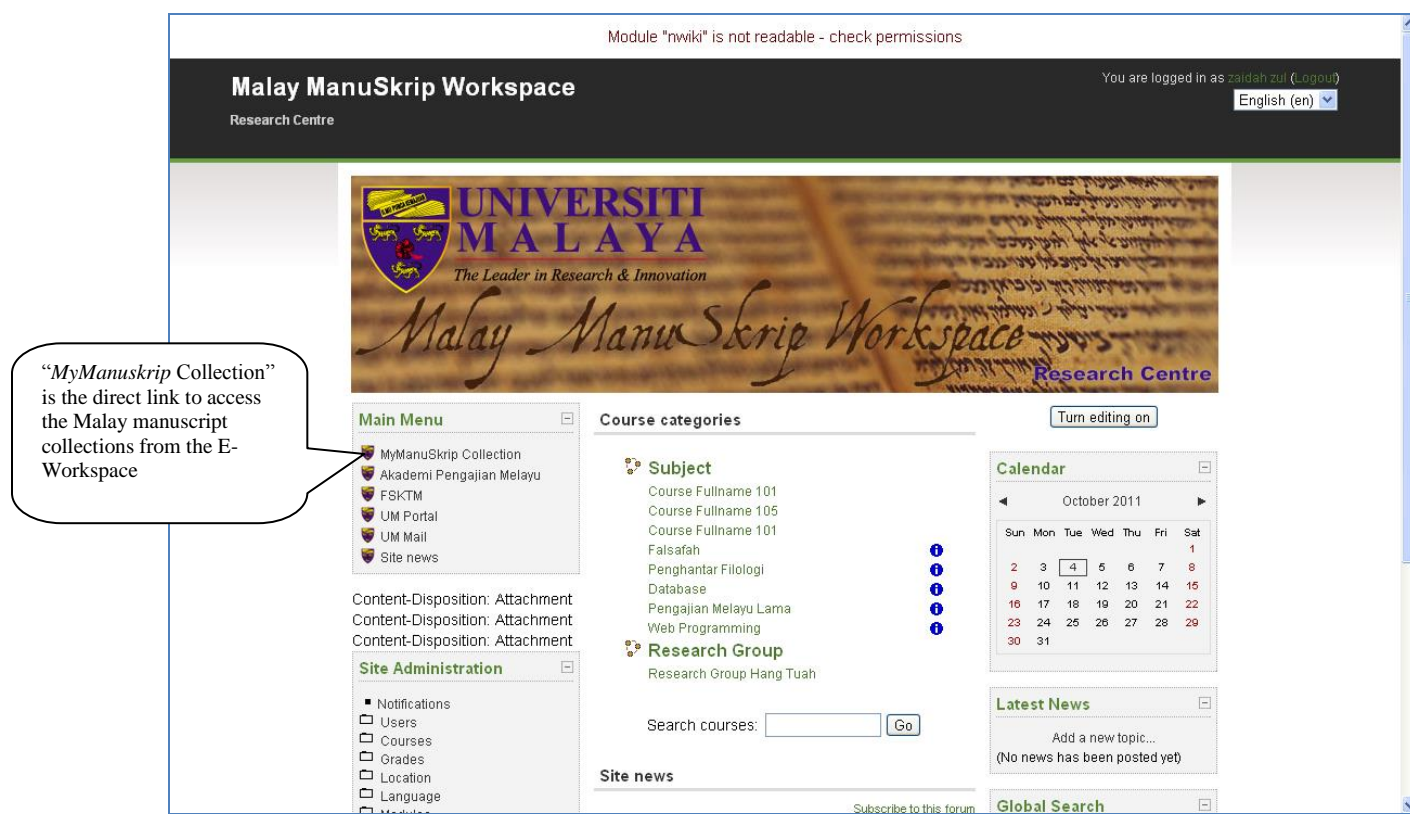


Figure 6.6:Interface after successfull log-in

The evaluation session also highlights the usefulness of the system as a platform to facilitate collaboration amongst Malay manuscript researchers worldwide as remarked by one researcher (UTR4), *“I have friends in Leiden University and we met when we attended seminars. We usually keep in touch through emails, but some of them are no longer active in manuscripts research and we have lost contact. This system may be able to reunite us”* (UTR4).

A student (UTS3) highlights his enjoyment in being able to exchange ideas and thoughts with peers while doing transliteration work, which he finds essential. *“It is really fun. I can give comments after my friends start doing their part in transliteration, so they can comment on mine”*. (UTS3).

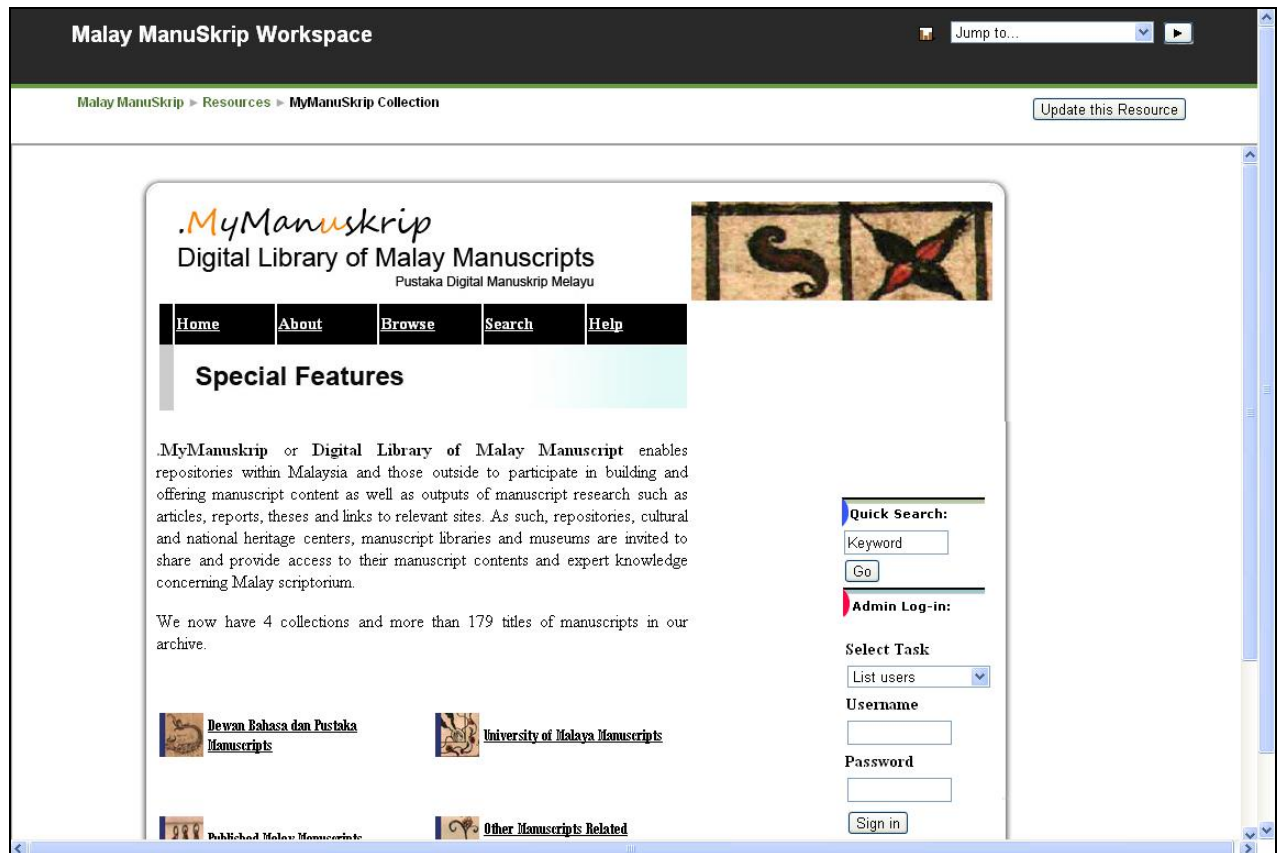


Figure 6.7: Direct Link from E-Workspace to *MyManuskrip*

Figure 6.7 shows the direct link from the E-Workspace which facilitates users to access manuscript collections. A lecturer (UTL1) said, *“When selecting manuscripts, students are able to see the list of manuscripts from the MyManuskrip collections that are available in this E-Workspace, I think this function is very helpful”*. However, one student (UTS2) expects an automatic transliteration function available in the workspace. *“When I heard*

about the system, the first thing that crossed my mind is an auto transliteration system that will allow users to transliterate from Jawi to Roman” (UTS2).

Another student (UTS8) expresses his concern on the possible resistance of adopting and using the workspace amongst the older generation. *“This is a good idea, but I’m not sure whether the older generation prefers to use this system. Most of them are old and using computers is sometimes troublesome for them”* (UTS8).

A lecturer (UTL3) tried out the function to share an announcement and give comments, *“I like this function, and so if I have anything to share, I just post it here. Sometimes, there are things that I forgot to tell them during the class”*. Figure 6.8 shows how lecturers add updates to be shared with the class.

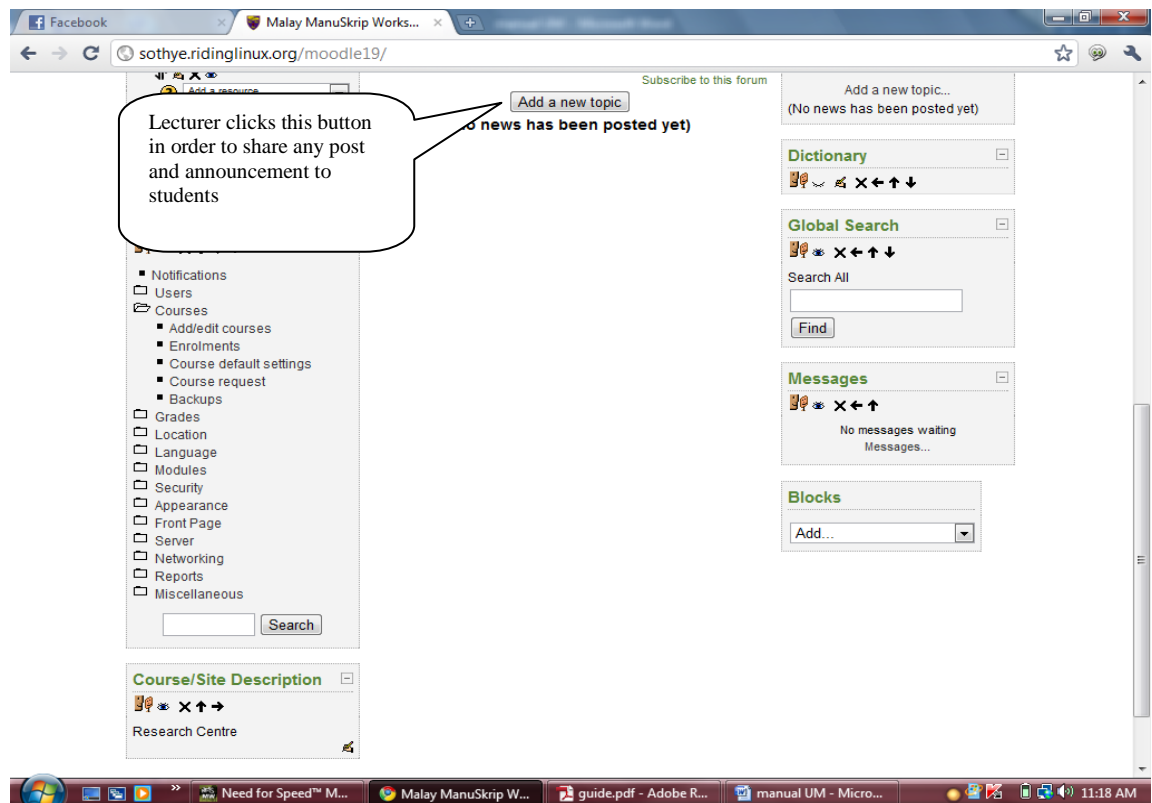


Figure 6.8: Interface Where Lecturers Can Add New Topics or News

6.3.3.2 User Feedback on Efficiency

In this study, efficiency refers to how quickly and directly users can complete a given task. Navigation design elements such as keyboard shortcuts, menus, links and other buttons are considered to have an impact on efficiency. Therefore, if these elements are well-designed, less time and effort are required for users to navigate and choose actions. It is observed from the evaluation session that fixed menus and navigation facilities prevent participants from getting lost in the system although several participants refer to the Help menu on several occasions in order to complete the given task.

Another participant (UTS1) remarked, “*The fixed menu on the left side of the workspace is really helpful. Sometimes I jumped to the wrong link but I can easily manage to find my way back to the right link*”. Beside the fixed menu, the E-Workspace also provides the root menu as shown in Figure 6.9 in order to show the path that user had been through in order to prevent lost when using the system.



Figure 6.9: Interface Shows the Root Tree of the Navigations

The usability testing indicates that participants experience difficulties while searching for manuscripts as a number of titles exceed 100 pages, which consumes significant downloading time and prevent them from completing the task on time. One student (UTS5) remarks, *“I think the list of manuscripts needs to be categorized not only by title, but also by year, type of handwriting and perhaps by author”*. Another student (UTS1) comments, *“It takes a long time to download the whole manuscript file in pdf format. I can’t imagine how I’m going to download the manuscript, having lower Internet speed at my home”* (UTS1).

One researcher (UTR3) highlights on system lag. *“I faced problems just now. Something went wrong with the account I used. I need to log in again when I wanted to use the Annotation Tool”*. A student (UTS4) remarks, *“I tried the live chatting tool. I think it is slow, and I’m not sure what the main cause is. I need to wait sometime before getting replies from my friends and once I received replies, I could only see a few lines and my friend was asking me questions why I was suddenly silent ...”*. However, this is found to be a temporary setback as sluggish network is experienced throughout the campus network.

One researcher (UTR3) suggested improvements to shorten interaction time with the system. *“I think it’s better to put the Transliteration Tool on the same page as the Annotation Tool. After annotating the manuscripts we need to click on the Transliteration Tool menu and perform transliteration in a different window. It is a waste of time”*. Figure 6.8 shows the interface where students edit assignments after using the Annotation and Transliteration tools.

6.3.3.3 User Feedback on Engagement

Engagement refers to the degree of which the system interface is pleasant, satisfying and enticing to use. During the post interviews, the respondents are asked whether the system interface, which includes colour tones, style and graphical images, are appealing and pleasing to use. In general, the participants are satisfied with the system interface, as one researcher (UTR4) comments, *“I love the interface very much. The drop down menu and navigation terms used are clear and understandable. The colour and font also reflects the Malay manuscript theme”*. However, another researcher (UTR1) states, *“The main interface is good, but the layouts of other modules are boring. They look too formal and*

serious”. This can be seen in Figure 6.10, which displays the main interface of the students’ page after log-in.

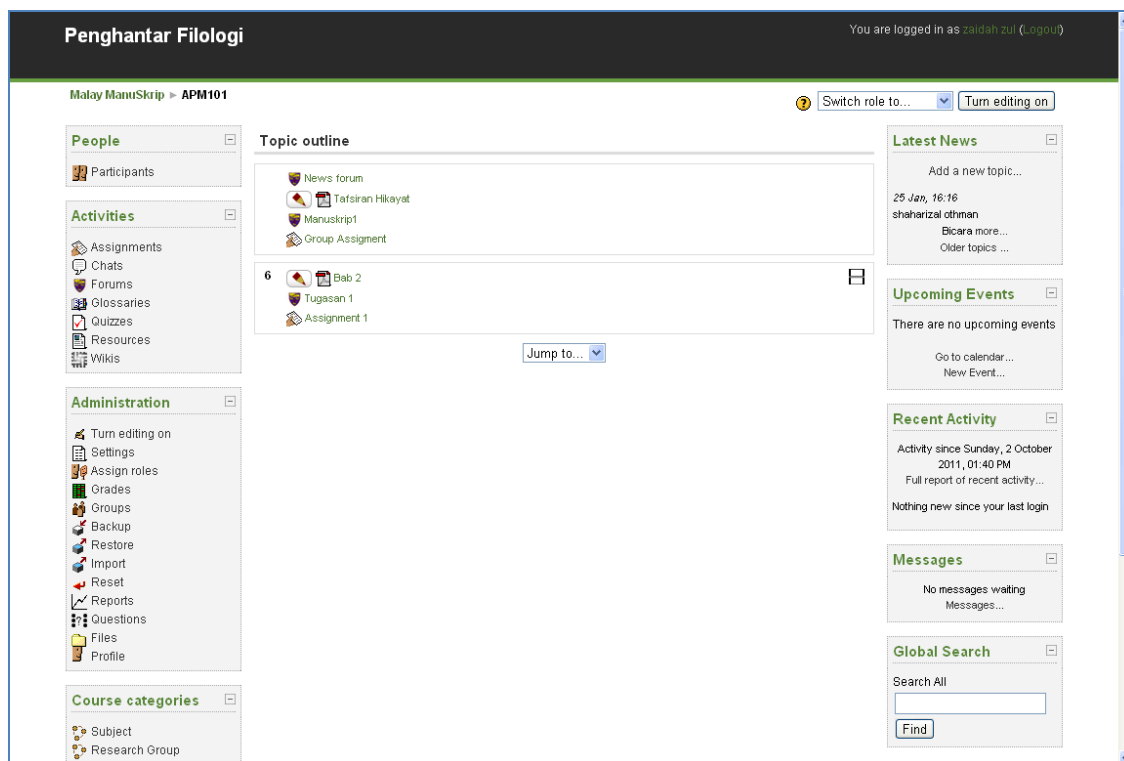


Figure 6.10: Student’s Main Page After Log-In

The clarity or quality of the digitized image of manuscripts unsatisfactory one student (UTS3) commented, *“Sometimes the manuscripts cannot be read clearly. I choose a number of manuscripts randomly, some are clear but some are very blurred”*. Another student (UTS5) commented on the organization of the manuscripts in the digital library, *“I think the list of manuscripts needs to be categorized not only by title, but also by years and by type of handwriting”*.

One researcher (UTR2) remarks on the default naming for the downloaded pdf files. When the student downloads the pdf file *“Hikayat Hang Tuah”* [*Tales of Hang Tuah*], the saved

file appears by default as “doc1.pdf” “The file name of Malay manuscript should be more specific and detail. I got confused when browsing the list of Malay manuscripts”.

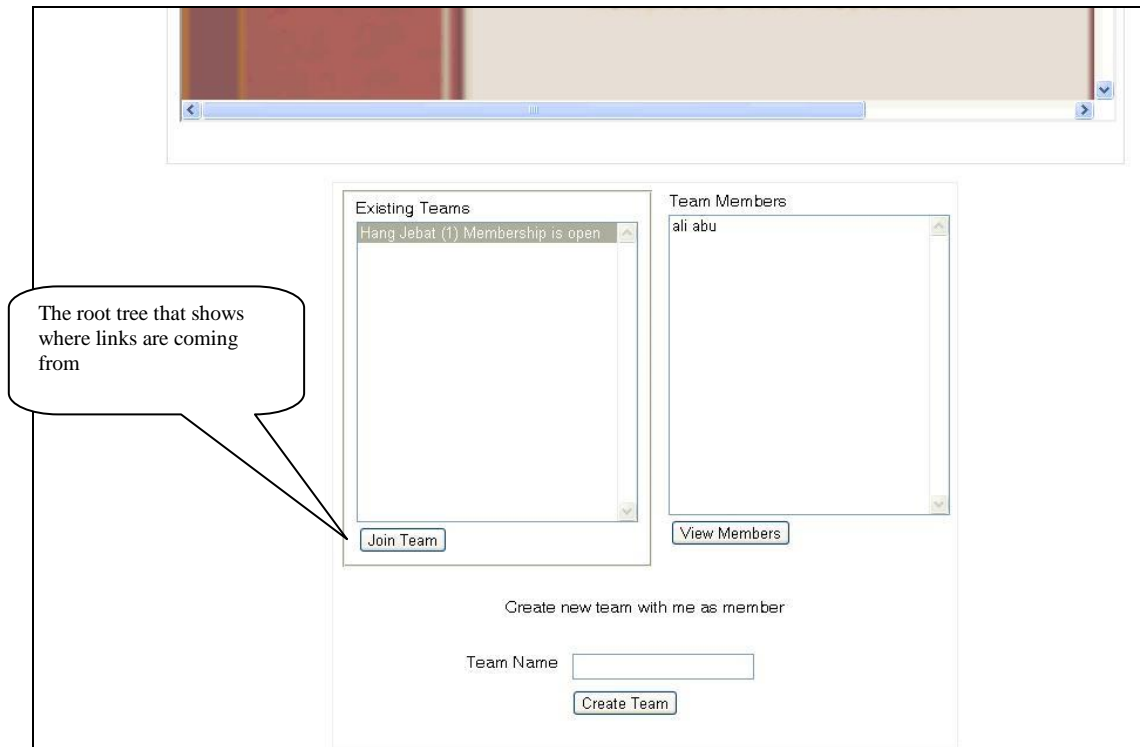


Figure 6.11: Interface to Create Group and Add Members

One researcher (UTR6) suggests that he prefers to be notified whenever a new manuscript has been uploaded. “At the “Home” screen, I think the administrator can post a notification on the latest collection of downloaded Malay manuscripts to inform the users”. A student (UTS7) said, “I act as the group leader, so I am the responsible person to create group and add members in my group. As shown in Figure 6.11 the cooperation between members are very important and the relationship between group members can be improved while doing the assignment by using the tools provided.

6.3.3.4 User Feedback on Error Tolerance

Error tolerance refers to how well the system design can prevent errors, or provide help for recovery. This is normally carried out by providing information, selections of actions to rectify the problem or other solutions. The *Malay Manuskript E-Workspace* provides a fixed front panel that prevents users from getting lost and this usefulness is commented by UTS1 (see Section 6.3.3.2).

When using the Annotation tool, shown in Figure 6.12, the system provides a pop-up to confirm whether the user wants to save the changes that have been made. This is important to prevent data losses as one researcher (UTS1) comments, *“I accidentally clicked the “X” button after performing some of the transliteration work fortunately, there was a pop-up dialog that prompts whether I want to save my transliteration or cancel”* (UTS1).

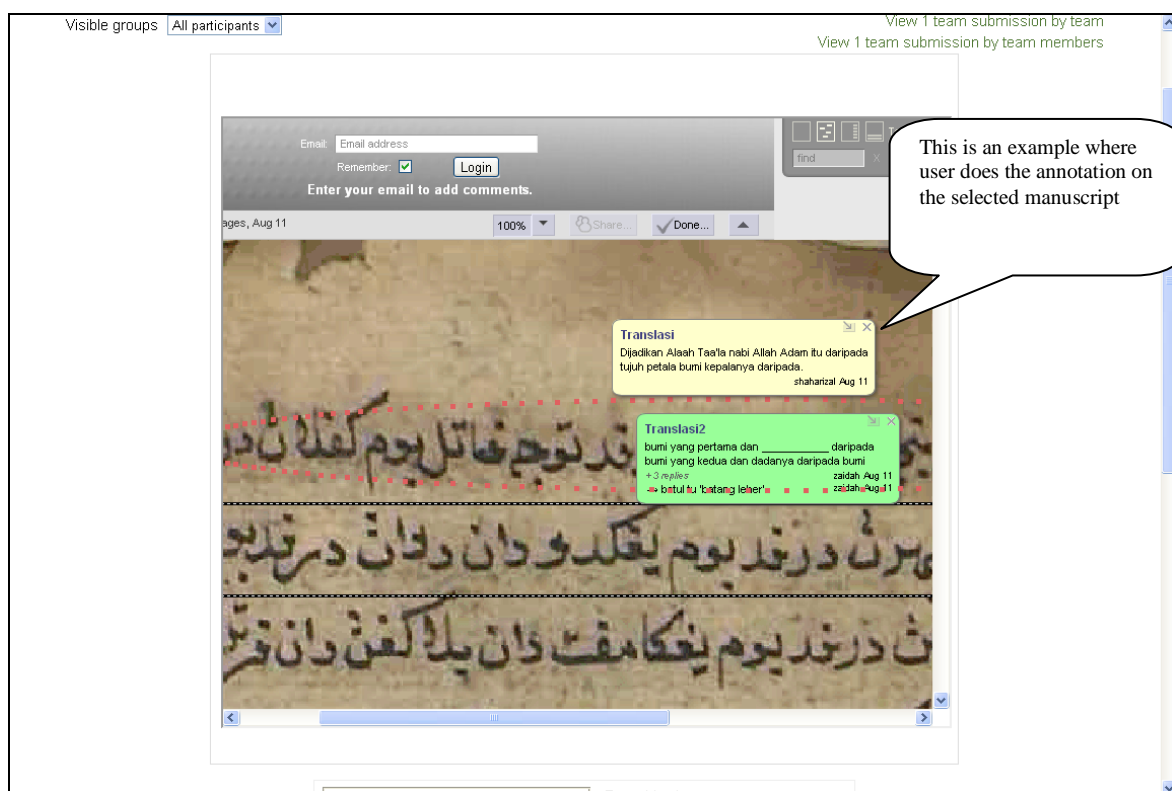


Figure 6.13: Interface of Annotation Tool

One of the lecturers (UTL3) expresses interest on the annotation tool, *“I love the annotation tool very much. It makes the transliteration works faster and it saved all the works done and it’s easy to retrieve back all the transliterated works”*. Figure 6.13 shows the interface of the annotation tool. This tool offers multiple options to view the annotated works, and a detail description about it is explained in the Appendix F.

6.3.3.5 User Feedback on Ease of Learning

Ease of learning determines how well the Workspace supports both initial first-use, followed by extensions for deeper understanding. The common features that are normally related to “easy to learn and remember” are the user interface and functionality of the Workspace that can be easily understood. For example, users should be able to remember the several options available in the Annotation Tool and navigate the system during the first time of usage. One evaluator (UTR2) finds that the system is easy to use and appreciates the chat feature. However, the evaluator requests that some explanation should be provided for each module. *“I like the live chat feature, as I can refer to someone when I am lost when I use the system”* (UTR2). Another participant (UTR5) suggests, *“Explanation of each module should be there, especially for the Annotation Tool. It has many good functions, and people will not know if they do not explore”* (UTR5). Figure 6.14 shows one of the options provided to view the annotated works.

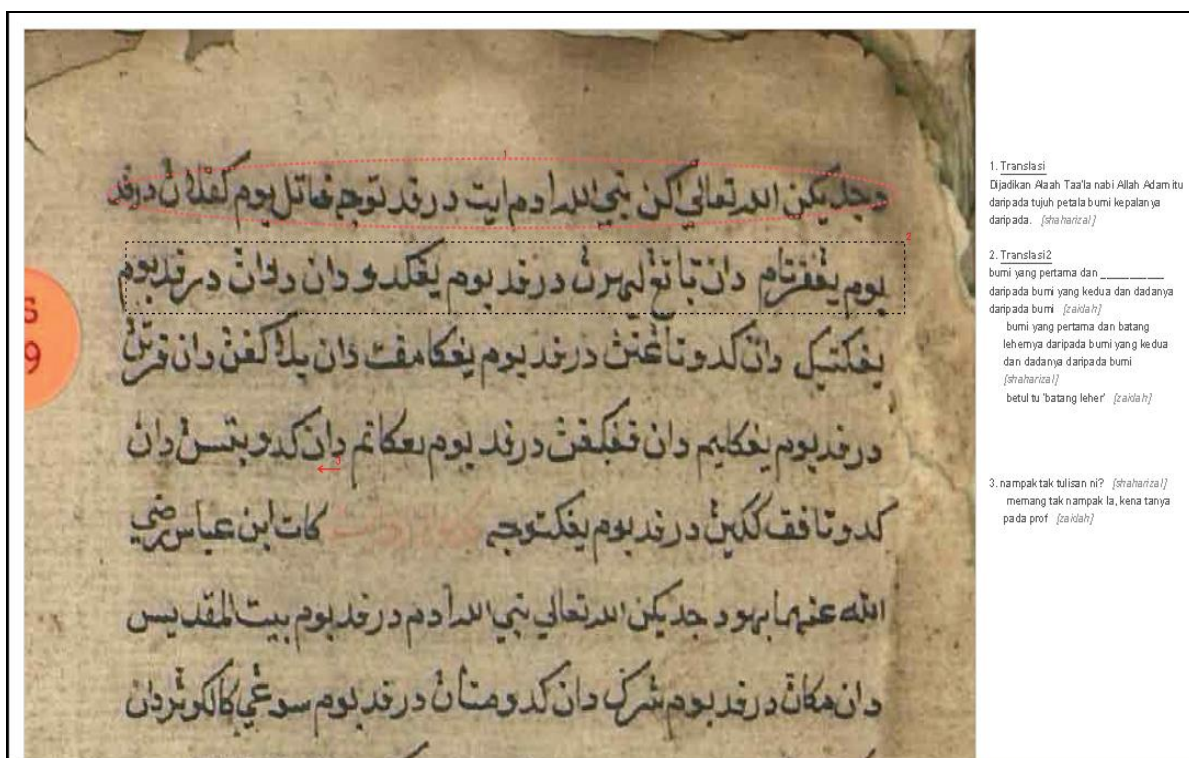


Figure 6.14: View of Assignment In Pdf Format

In addition, one researcher (UTR6) requests that some examples of transliterated works should be included as reference. *“Perhaps examples of transliterated works can motivate us to do better transliterations”*. Another researcher (UTR8) challenges, *“Why not provide us with a tutorial video, share it on Youtube, and include the video in the Help menu”*. One of the discussion methods can be used during assignments is the chat tool, as shown in Figure 6.15.

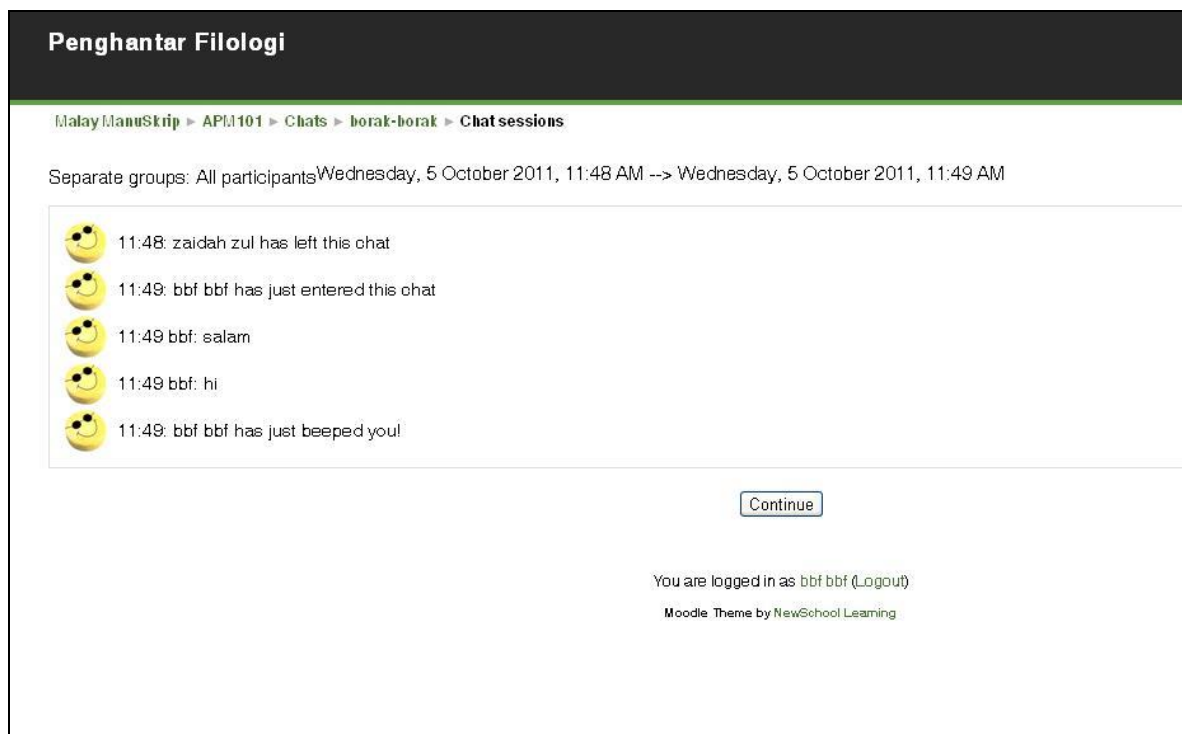


Figure 6.15: Chat Tool

6.4 Summary

This chapter compares and identifies changes made to the current process of teaching, learning and researching Malay manuscripts. The current process of teaching, learning and researching Malay manuscripts was compared with the proposed Malay manuscript E-Workspace then a usability testing was conducted to gain feedback from users (paleographers) towards it.

The findings indicated a positive reaction from participants towards the e-Workspace where most of the users indicate that they consider the prototype to be effective. When carrying out the given tasks, users were observed to be able to successfully and correctly complete transliteration tasks. Users also highlighted the usefulness of the system as a platform to

facilitate collaboration among Malay manuscript researchers all over the world and essentially being able to exchange ideas and thoughts with peers while doing transliteration.

Table 6.3: Comparison of Existing *MyManuskrip* with the *MyManuskrip* E-Workspace

Features	Digitized collection	General Functionality	Annotation Tools	Document Delivery	Working With Group Members	Working with Lecturers	Glossary	Transliteration Tools	Searching	Submission and Grading System
Existing <i>MyManuskrip</i>	√	X	X	X	X	X	X	X	√ (basic searching)	X
Malay Manuscript E-Workspace	√	√	√	√	√	√	√	√	√ (advanced searching)	√

Table 6.3 shows the comparison of the features in the existing *MyManuskrip* digital library with the *MyManuskrip* E-Workspace. Set of common features were incorporated from the comparison of digital library initiatives worldwide in Chapter 2 and also from the data collected from Chapter 4 and Chapter 6. These comparisons above help the researcher to come out with a set of common features that is used to design modules and functionalities of *MyManuskrip* E-Workspace.

As a system prototype, *MyManuskrip* e-Workspace has demonstrated its capabilities to better serve Malay manuscript studies communities in teaching, learning and researching activities as has been reflected by the positive feedback from the users. A number of useful comments and suggestions were put forward in the focus group sessions. These responses were the most revealing outcome of the evaluation exercise as the statements were specific and insightful. Some of the essential ones are 1) the expectation of an automatic transliteration function to be available in the e-Workspace, 2) concern about the possible resistance to adopting and using the e-Workspace among the older generation, 3) that notifications should be posted to members when new manuscripts had been uploaded in the

digital library and 4) that it would be helpful if some examples of transliteration works were available to refer to while doing the work.

CHAPTER 7

CONCLUSION

7.1 Overview

The primary focus of this study was to instrument the support for Malay manuscript teaching, learning and researching by eliciting the paleographers' needs and modeling a collaborative workspace that utilizing an available digital library of Malay manuscripts. The test bed consisted of lecturers and students from the "Introduction to Philology" course within the domain of Malay manuscripts since it was the course objectives that these students would individually demonstrate their transliteration skills and understanding towards Malay manuscripts. This study specifically seek to determine the teaching and learning process of Malay manuscripts for "Introduction of Philology" course and the research process for postgraduates at APM, UM.

There are numerous studies on digital library of manuscripts. This study however, was solely focused on Malay manuscripts domain. The *MyManuskrip* project was initiated to provide a collaborative digital library environment for Malay manuscript libraries to upload digitized manuscript collections into a union repository and share resources (Zainab, et al, 2009). However, this system only provides collection of Malay manuscripts without services that support teaching, learning and research. There are a number of digital libraries of manuscripts available worldwide such as the *Islamic Heritage Project* (IHP), Harvard University, which catalogues, conserves, and digitizes hundreds of Islamic manuscripts, maps and published texts from Harvard's renowned library and museum collections. Similar to *MyManuskrip*, this digital library only provides collections of manuscripts.

There are only a few numbers of studies on manuscript learning space. Such learning spaces are offered without digital collections. The BAMBI system (Calabretto and Bozzi, 1998) provides a tool for philologists to write annotations, navigate between words of the transcription and match pieces of images in the numerated picture of the manuscript (Bozzi and Calabretto 1997; Calabretto and Bozzi 1998). However, there are no studies which specifically address the issue of digital library with services within the domain of Malay manuscripts.

This study is the only research in Malaysia that addresses such issues and thus one would expect that the results and outcomes reflect the actual situation with regards to the acquisition of Malay manuscript study skills in Malaysian institutions of higher learning.

From the onset of the study, the objectives are determined as:

To instrument the support for Malay manuscript community (paleographers) in teaching, learning and doing research on manuscript in an electronic environment utilizing an available digital library of Malay manuscripts. This study specifically aims to achieve the following objectives:

- v. To investigate the current process of teaching, learning and researching manuscripts in Malay manuscript community that mainly involve lecturers, students and researchers (or known as paleographers).
- vi. To investigate what are the issues and challenges related to teaching, learning and researching in manuscript studies community.
- vii. To propose a new environment as a solution that can support and improve the process of teaching, learning and researching in manuscript studies.

- viii. To evaluate the usability of the suggested solution and gain insight from the paleographers (lecturers, students and researchers) on its effectiveness.

The Soft Systems Methodology (SSM) was used as the central methodology for this study in order to attain the objectives and answer the research questions. The data was collected by three different methods which were interviews, focus group discussions and class observations. The data were collected from lecturers who were involved in teaching Malay manuscript courses, Malay manuscript researchers, students and ex-students for the Malay manuscript course and the general public who contributed to Malay manuscripts world. Observations were made during the Malay manuscript class within a semester period. This leads to the design and development of a Malay manuscript E-Workspace, which was delivered to the lecturer and students of the “Introduction to Philology” course as well as researchers in Malay manuscript studies.

7.2 Answering the Research Questions

Within the context of this study, each individual research question has been answered and discussed in Chapters 4, 5 and 6. The first two research questions are addressed in Chapter 4 and the third research question is addressed in Chapter 5. Subsequently, the fourth research question is addressed in Chapter 6. In this section, a summary of salient findings are presented, followed by discussions of each research question.

7.2.1 Research Question 1

What are the processes that paleographers (lecturers, students and researchers) endure when conducting Malay manuscript studies?

From the findings in Chapter 4, it can be concluded that the processes in which paleographers need to undergo when in manuscript studies are as follows:

(a) Lecturers: The main process involved in learning Malay manuscripts is transliteration.

Transliteration is mapping from one system of writing into another, word by word, or ideally letter by letter (Wikipedia) and in this class, the students need to transliterate the old *Jawi* scripts to Romanized Malay without altering the pronunciation of the words in the manuscript. There are three methods used in studying Malay manuscripts, i.e. Transliteration, Annotation and Transcription. In general, selection of a method is left to the students as some prefer to study manuscripts using their own style. In the course, students are given a group assignment which requires them to conduct transliteration, analysis and research of the manuscript's author. Most lecturers have research experience in Malay manuscripts studies for years. The criterion for studying Malay manuscripts is that one should have a sound understanding of *Jawi*.

(b) Students: The “Pengantar Filologi” course is carried out 3 hours a week in a duration of 14 weeks. In addition to the 2-hour lectures, students are required to attend tutorial sessions. The tutorial sessions assist students in completing the assignments given. The teaching process is usually carried out on a one-way basis during lectures. Computers and Internet facilities are unavailable during tutorial sessions. Lecturers are more comfortable teaching using the chalk-and-talk approach. The transliteration process is compulsory prior to analyzing a manuscript. Even though most students are able to read

Jawi, the students face problems to read and comprehend the manuscripts due to old language use.

- (c) Researchers: The transliteration process is a necessity for researchers prior to analysis of Malay manuscripts. According to one researcher, all researchers involved in researching Malay manuscripts know *Jawi* even though they are non-Malays or non-Muslims. The researchers report that the most important reference is a dictionary, which is used during the transliteration process.

7.2.2 Research Question 2

What are the issues and challenges faced by paleographers in the process of teaching, learning and researching Malay manuscripts?

- (a) Lecturers: One of the problems in Malay manuscript studies is lack of time. The duration of 14 weeks (1 semester) is inadequate to ensure that the entire syllabus is fully delivered to the students. There are a few philologists available in APM for students to seek for advice. According to L1, it is difficult to find philologists nowadays. Searching for Malay manuscripts never used by previous students poses a problem to students, due to the lack of Malay manuscript resources available. In order to rectify this problem, lecturers allow the students to use printed or edited versions of Malay manuscripts, indicating that the students are working on the works of others. The printed versions of manuscripts refer to the original manuscripts that have been copied and printed in books or papers. Transliteration on printed versions may result in overlapping of transliteration works as students and lecturers are uncertain whether the manuscripts have been transliterated

previously. Another problem involves non-Malay students who do not understand *Jawi*. It is not the responsibility of the University to teach *Jawi*. Saving and conserving old manuscripts require initiative and budget. In University of Malaya, there is no 'special' place to store original manuscripts. Manuscripts need to be located in a room with a suitable temperature whereby others cannot enter the room without wearing face masks and protective gloves in order to protect the old and fragile manuscripts. Most people are unaware on the regulations for preserving manuscripts.

Another problem raised is the ICT usage and skills among the lecturers. The lecturers report that the computers are used for professional work, Internet browsing and e-mails. However, they are not frequent computer users. In terms of word processing, creating spreadsheets and slideshows, one lecturer claims that he does not use the computer for preparing class materials. The lecturers claim that they can perform their daily tasks without computers even though they are each given a computer or laptop by the faculty. The lecturers are unaware on the existence of a digital library for Malay manuscripts. One of the factors that contributes to the seldom usage of computers is that the lecturers have begun teaching since the 1980s and 1990s, whereby computer and Internet usage are still in their infancy. However, they are generally aware and willing to accept on the existence of computers and Internet as a medium for teaching and learning. In general, the lecturers exhibit similarities in their attitude and opinion on the value of the Internet as a teaching and learning tool and teacher-directed student use, regardless of their ICT skills.

- (b) Students: Besides lecturers, there are no other experts to whom students can refer to if they face difficulties when doing their assignments. The time given during tutorial sessions needs to be used wisely, unless the students can arrange a different meeting with the lecturers. Students are given the opportunity to discuss with lecturers and other group members during tutorial sessions. Most of the manuscripts are found in printed versions.

All students are frequent users of the Internet and claim that they spend 3-5 hours a day on the Internet, particularly for browsing and social networking. The students possess computers and Internet facilities at home, and they have a computing facility at the faculty. Two students possess their own laptop. In addition to the Internet, they use computers for word processing, creating spreadsheets and slideshows. All assignments are prepared using computers and submitted to the lecturer in soft and hard copies. The students are unaware on the existence of a digital library for Malay manuscripts. They are aware on the benefits of ICT usage and reported that their day feels incomplete without computers. The students do not face problems in new Web-based systems and are willing to learn a new system on their own. Computers and Internet facilities are unavailable in tutorial sessions. The lecturers feel more comfortable teaching using chalk-and-talk approach. The students agree to promote Malay manuscript studies to younger generations.

- (c) Researchers: References refer to documented references such as dictionaries, theses and journal articles. According to the researchers, the reference books in Malay manuscript studies are not abundant compared to other reference books such as

Science, Architecture or Computing. Sometimes the researchers loan books and theses from lecturers in the faculty. Malay manuscript experts can be found in many locations globally. The researchers report that there are a number of experts in Malay manuscript studies in England and Holland, and the manuscript collections are available there. In Malaysia, most of the experts are from the older generation and some have retired.

The researchers are unaware of the existence of digital resource for Malay manuscripts. The researchers believe that the digital library of Malay manuscripts is not fully promoted. The researchers perceive that it is crucial to increase awareness about the system, particularly to the Malay manuscript community. The use of ICT usage amongst the Malay manuscript community is still very low, especially amongst the elders.

7.2.3 Research Question 3

How to model a digital workspace that could facilitate paleographers needs when studying Malay manuscripts?

The answer to this question has been explained in Chapter 5. The learning space is derived from the final step in SSM, which involves the development of the conceptual model based on CATWOE analysis and root definition. This allows the actors to achieve the transformation put forward in the CATWOE analysis. The conceptual model includes all activities that need to take place in order to achieve the desired transformation and these activities need to be carried out within a system boundary. The conceptual model

depicts the activities to be undertaken by the actors defined in the root definition, which is limited to a group of people. Monitoring becomes a problem when multiple groups are involved. The conceptual model therefore, represents only the desired human activities, and is developed to display how various activities from different stakeholders in the current system are related to each other based on the root definition. The conceptual model demonstrates how technology can help solve the problems expressed by the Malay manuscript community by mapping it onto a proposed system.

The conceptual model should include operational and supervisory activities. The operational activities are derived and formulated from published literature, data collected and analyzed for the initial portion of the study, lecturers' and students' involvement in the teaching and learning process for the Introduction to Philology (JEEA3321) course conducted by APM, UM as well as the researchers' involvement in Malay manuscript studies in APM UM. Therefore, the transformation is expected to provide the stakeholders with the following activities via the system.

Basically, the learning process of the students in the class depends on the lecturer, and the students have simultaneous interactions with other people such as parents, siblings, friends whereby they can request for assistance. A number of students also interact with other lecturers and librarians for assistance. However, the main disadvantage of the students' learning process is that they are fully dependent on the lecturer. Rather than learning through a holistic approach, the students learning manifests itself into a form of transliteration process, where the students gather data that they only deem necessary. The problems mostly faced by students are associated with finding resources, Malay manuscript

collections, experts to refer to, as well as time. Since the main process involved in learning Malay manuscripts is the transliteration process, the students should have good transliteration skills and they need guidance from experts. The results from the data collection have a variety of implications for the design of the content creation, tools and modules in the workspace, and the display format of the reports, as indicated in Table 5.1. The design implications have been expressed in the conceptual model.

7.2.4 Research Question 4

What is the perceived usefulness of the digital workspace from the paleographers' point of view?

The testing and evaluation component of this study is conducted to gather feedback on the satisfaction level, technical problems and suggestions for improvement to the E-workspace of Malay manuscript prototype. The assessment of the workspace usability involves user evaluation testing to identify system performance, user acceptance and functions that require improvements. Evaluation is measured based on five usability dimensions, namely, efficiency, effectiveness, engagement, error tolerance and ease of learning (Quesenbery, 2003). User evaluation is carried out in two phases. In the first phase, the participants are given several tasks to perform while using the *MyManuskrip* E-Workspace. This method is proposed by Chapanis (1991), whereby the participants are given several tasks to perform in a defined set of environments. The participants are gathered in a digital library research laboratory at the Faculty of Computer Science and Information Technology, University of Malaya, and are requested to use the *MyManuskrip*

E-Workspace to complete a set of tasks within one hour. Two separate sessions are held for the evaluation. The first session comprises of eight students who have attended the “Introduction to Philology” course, and have agreed to participate in the *MyManuskrip* E-Workspace project. The second session comprises of eight researchers who are undertaking their Masters or PhD research programme at APM.

The results show the feedback from students and researchers after they have completed the assigned tasks. The feedback is given in verbatim statements by respondents to emphasize the findings. The findings indicate a positive reaction from the participants towards the Workspace, with the highest average of 87.5% for effectiveness, followed by 75% on error tolerance, 68.8% on engagement, 56.3% on ease of learning and 31.3% on efficiency.

7.2.5 Completing the SSM

The study is conducted by using the conventional seven-stage Soft Systems Methodology (SSM). Although SSM is an information systems methodology, it has been used in other disciplines including library science. In library science, SSM has been used by Brown-Syed (1996), Vega Diaz (2003), Somerville et al. (2006) and Davis and Somerville (2006). The other studies apply SSM in other areas of library science such as to initiate change in management of library services and to develop information systems.

All components of the current study can be fitted into the seven stages of the SSM, resulting in a five-phase model. The five phases are labeled as “Finding out”, “Analyzing with CATWOE and formulating root definition”, “Developing the

conceptual model”, “Comparing the conceptual model with the problem”, and “Identifying and making changes”. By using SSM in this study, it is possible to carry out the study from Phase 1 to Phase 5. SSM has been successfully implemented in this study.

7.3 Significance of the Study

In its entirety, this study is significant internationally and nationally. SSM is a methodology that is synonymous with systems design and information systems design. In this study, SSM is used to tackle issues associated with library and information science. To date, there are no published literature on the use of SSM to solve problems associated with the design and delivery of an E-Workspace in the domain of Malay manuscript community which also provides a Malay manuscript digital library. SSM has been successfully applied in this study and can be replicated by other researchers who are doing similar or related research.

The seven stages of SSM allow looking at paleographers’ view and their involvement with the problem. This, in turn, enables a solution which is applicable to all. At present, there are no published literatures on the use of SSM as a benchmark for Malay manuscript studies. This study is initiated from the Digital Library of Malay Manuscripts known as *MyManuskrip* (available at <http://MyManuskrip.fsktm.um.edu.my>) which is a digital repository of handwritten *Jawi* script (adapted from Arabic alphabet) in Malay language. Malay manuscripts are dated as early as the 15th century and represents the historical records of 500 years of Malay historiography, laws of the Malay Sultanate, Malay governance, ancient foreign policies, folk science, medicine, religion, beliefs, Malay

literature and culture, Malay rites and rituals, astrological and folk literature such as “syair”, “gurindam”, “hikayat” (the Malay form of sonnets). *MyManuskrip* is a digitization initiative developed to preserve, organize, and make manuscripts accessible through the Web for researchers, scholars and the general public interested in reading, browsing or studying Malay manuscripts.

MyManuskrip currently provides users with options to browse and search a single collection or cross-collections and provide university departments that offer courses on manuscript studies with e-manuscript collections for teaching and learning, particularly in transliteration (Zainab et al., 2009). However, *MyManuskrip* does not support teaching, learning and research environment, which are demanded for in transliteration and annotation activities. Zainab et al. (2009) found that one of the problems faced by the manuscript teaching and learning community is that they are unable to establish a dynamic collaborative platform amongst researchers and scholars or groups of manuscript studies students involved in joint transliteration works. A digital library with an annotating and transliterating tool will greatly stimulate social and educational networking.

The result of this study indicate that the provision of an online platform to support the teaching, learning and research activities as well as the use of resources from *MyManuskrip*, is generally welcomed by philology lecturers, students and researchers at the APM, UM. The proposed modules should specifically support teaching, learning and resesarch activities, use current digital manuscript resources from *MyManuskrip*, allow lecturers to upload their syllabus and teaching resources, support interactivity in terms of student-lecturer and student-student discussions, uploading transliterated assignments as a collection

in *MyManuskrip*, and provision of a dictionary of terms to assist manuscript researchers. Generally, the proposed system should be able to support discussions and sharing of knowledge while promoting Malay Manuscripts to a wider audience.

7.4 Further Works

It is hoped that this study will “jumpstart” other studies related to various aspects of Malay manuscript studies. Based on the findings, the following proposals for recommendations are made for future works.

- (a) Improvement of the Annotation tool: An important finding from the user evaluation interviews shows the need for students to be able to view the lecturers’ comments or feedback regarding their project reports and this requires the lecturers to be able to annotate directly on the digital report. Therefore, it is necessary to embed an Annotation tool which enables lecturers to create annotations (such as comments, notes, explanations, or other types of external remarks) which are stored and displayed with the reports for all viewers. The potential of adding value to digital resources by using various approaches to ‘annotation’ is illustrated by the large number and diverse approaches and implementations of such systems on the Web. Open source asynchronous annotation tools designed specifically to support the process of reviewing; annotating and publishing documents in a digital library can be integrated and used in the collaborative digital library. These tools will allow students to grant appropriate permissions to reviewers such as teachers and friends, and the reviewers can annotate and comment on the reports using a highly personalizable interface, which

simplifies the reviewing process. The students can then make corrections or changes to their reports by following the suggestions made by reviewers.

(b) Improvement of the “Working with Group Members” module: In general, the findings for digital library design are consistent with those of Hill et al. (2000). Hill et al. (2000) suggested that digital libraries are perceived as social environments although they provide a different environment and support new users. Hence, digital libraries should maintain a sense of person-to-person since they are perceived as social environments and therefore should maintain a person-to-person connection (Hill et al., 2000). There is a consistent demand for human connection, which is a way for users to address others. The features that can assist users to share knowledge across the community and to form special interest groups, as follows:

- i) synchronous and asynchronous collaborations amongst students working on similar interests or project topics;
- ii) synchronous and asynchronous collaborations amongst students, lecturers and subject experts
- iii) synchronous and asynchronous collaborations amongst students working in a team for ongoing projects
- iv) synchronous and asynchronous collaborations amongst researchers working in a team for ongoing projects

- v) Collaborative information exploration, whereby lecturers, students and researchers can search and examine resources while viewing the activities of others and carrying out discussions concurrently.

7.5 Concluding Remarks

The process of designing, developing and implementing the Malay manuscript E-Workspace is challenging. APM is the domain used as the test bed towards the implementation of a Malay manuscript E-Workspace, which serves the needs of the Malay manuscript community. The E-Workspace emphasizes on collaborative resource development and knowledge sharing, and such system requires a robust and efficient retrieval system. There are very few local resources or similar systems in Malaysia that can be located and used as reference. As such, the functional development is mainly based on the literature regarding such ventures abroad associated with the development of digital libraries and an understanding of the domain's environment inside and outside Malaysia. The study uses the SSM to conduct a needs assessment, develop a conceptual model and design a prototype for the Malay manuscript E-Workspace. Assessing the users' needs via interviews, focus group discussions and observations provide invaluable information regarding the paleographers' needs and community's perception of digital sources, as well as provide the researcher with a blueprint for moving forward in a way that corresponds with user-defined needs. The modules developed provide creating, capturing and sharing data from *MyManuskrip*, as well as support collaborative resource development between various user groups.

This is the strength of the system as it encourages active participation, which will produce the desired outcome in terms of ICT literate lecturers, students and researchers in the long term and the experience of creating or publishing works in Malay manuscript studies. To successfully implement the system between paleographers, a number of problems need to be ironed out. The lecturers involved should be given training in publishing digital resources and equipped with the skill of indexing and validating resources to ensure that the contents of the library can be efficiently retrieved. All paleographers must accept the reality that the richness in content of the digital library is dependent upon their active participation as partners. The success of this system development initiative depends on the willingness of the community to participate and changing one's mindset concerning the delivery or submission of Malay manuscripts projects.

This study shows that if *MyManuskrip* are to be included as one of the main reasons that motivate students and lecturers to go online, students and lecturers should be aware about it, learn to use it effectively, and value its resources. If this E-Workspace is going to be a valuable instructional tool in the next century, Malaysians require human, technical and curriculum resources to help prepare meaningful Internet-related curricula as well as time to weave technology into the existing Malay manuscript studies. Lecturers should acquire a new set of instructional strategies for teaching using the E-Workspace, rather than merely learning how to use it. This ideological shift may happen naturally as our larger educational society becomes more techno-literate.

REFERENCES

- Abdullah, A., A.N. Zainab, and Yu, H. (2006). Supporting information literacy practices in digital information environment: An approach using a collaborative digital library for school projects. Proceedings of the International Conference on Information Literacy, Kuala Lumpur, Malaysia, 14-15 June 2006. (18p)
- Abdullah, A. (2007). Are Malaysian Students Ready to Be Authors of Digital Contents ? A Case Study of Digital Library Stakeholders ' Readiness, *1*(Fall), 55–73.
- Abd Rahim Abd Rashid. (2000). Model dan pendekatan pengajaran sejarah KBSM. Kuala Lumpur: DBP
- Abrizah, A and Zainab, A. N. (2006). Ascertaining Factors Motivating Use of Digital Libraries and Formulating User Requirements Using Zachman Framework. *Malaysian Journal of Library & Information Science*, Vol.11, no.2, Dec 2006: 21-40
- Adam, N., Yesha, Y., & Al, E. T. (1996). Strategic Directions in Electronic Commerce and Digital Libraries : Towards a Digital Agora, 28(4), 818–835.
- Akademi Pengajian Melayu, Universiti Malaya (2008), Buku Panduan Sarjana Muda Pengajian Melayu Sesi 2008/2009, Kuala Lumpur: Universiti Malaya.
- Anderson, I. A. N. G. (n.d.). Are You Being Served ? Historians and the Search for Primary Sources *.
- Bjerke, O. L. (2008). Soft Systems Methodology in action : A case study at a purchasing department, 1–107.
- Borgman, C. L. (1996). Why are online catalogs still hard to use? *Journal of the American Society for Information Science*, 47(7), 493–503. doi:10.1002/(SICI)1097-4571(199607)47:7<493::AID-ASI3>3.3.CO;2-Y

- Borgman, C., Bates, M.J., Cloonan, M.V., Efthimiadis, E.N., Gilliland-Swetland, A., Kafai, Y., Leazer, G.L., and Maddox, A. (1996). Social aspects of digital libraries. Final report to the National Science Foundation; Computer, Information Science, and Engineering Directorate; Division of Information, Robotics, and Intelligent Systems; Information Technology and Organizations Program. Available at: <http://is.gseis.ucla.edu/DL/>.
- Borgman, C.L. (2000) "Digital libraries and the continuum of scholarly communication", *Journal of Documentation*, Vol. 56 Iss: 4, pp.412 – 430
- Borgman, C. L. (2011). Why are the attribution and citation of scientific data important? (keynote). Developing Data Attribution and Citation Practices and Standards: An International Symposium and Workshop, Berkeley, CA, US CODATA and the Board on Research Data and Information, in collaboration with CODATA-ICSTI Task Group on Data Citation Standards and Practices Retrieved from http://sites.nationalacademies.org/PGA/brdi/PGA_064019 on 8 December 2011.
- Bothma, P. (2006). Design Implications of An Online Collaborative Workspace Developed Using Open Source Software. *dissertation*, (November).
- Bozzi, A. and Calabretto, S. (1997). The digital library and computational philology: the BAMBI project, In *Research and Advanced Technology for Digital Libraries*, Vol.1324: 269-285.
- Bozzi, A., Calabretto, S., Corradini, M.S. and Tellez, B. (2005) “The EUMME Project: towards a new philological workstation”, paper presented at the Proceedings ELPUB 2005 Conference on Electronic Publishing – Kath. Univ. Leuven , June, 2005, Leuven, available at: <http://elpub.scix.net/data/works/att/163elpub2005.content.pdf>. (accessed 4 March 2011).
- Brember, V.L. (1985a) "Linking a medical user survey to management for library effectiveness: I, the user survey", *Journal of Documentation*, Vol.41 No.1 pp1-14

- Brocks H, Thiel U, Stein A, Dirsch-Weigand A (2001) Customizable retrieval functions based on user tasks in the cultural heritage domain. In: Constantopoulos P, Sølvsberg I(eds) Proceedings of the European conference on research and advanced technology for digital libraries (ECDL 2001), Darmstadt, Germany, September 2001. Lecture notes in computer science, vol 2163. Springer, Berlin Heidelberg New York, pp 37–48.
- Brown-Syed, C.L. (1996), “From CLANN to UNILINC: an automated library consortium from a soft systems perspective”, PhD thesis, University of Toronto, Toronto.
- Burton, M. (1998). Computer modelling of dialogue roles in collaborative learning activities. Unpublished doctoral dissertation, Computer Based Learning Unit, The University of Leeds.
- Bush, V (1945). "As We May Think," *The Atlantic Monthly*, 176, 1, 101-108.
- Calabretto S., Bozzi A.1998. The Philological Workstation BAMBI (Better Access to Manuscripts and Browsing of Images). *International Journal of Digital Information*, Vol.1, no.3:1-17. Available at: <http://journals.tdl.org/jodi/article/viewArticle/10/20>
- Calabretto, B. R. and S. (1999). Virtual library for ancient manuscripts. *Library Review*, 48(4), 181–187. doi:10.1108/00242539910276460
- Champeney, E. a. (n.d.). Developing a Digital Learning Environment,An Evaluation (Champeny, et.al., 2004).pdf.
- Chapanis, A. (1991), *Evaluating Usability*, Cambridge University, Cambridge, UK.
- Checkland, P. (1981), *Systems Thinking, System Practice*, John Wiley: Chichester
- Checkland, P., Scholes, J. (1990). *Soft System Methodology in Action* . John Wiley: Chichester.
- Checkland, P. and Scholes, J. (1999). *Soft Systems Methodology in Action: Includes a 30-Year Retrospective*, England: John Wiley & Sons, 1999.

- Choi, Y. (2006). Reference services in digital collections and projects. *Reference Services Review*, 34(1), 129–147. doi:10.1108/00907320610648815
- Crane, G., Wulfman, C. E., Cerrato, L. M., Mahoney, A., Milbank, T. L., Mimno, D., Rydberg-, J. A., et al. (n.d.). Towards a Cultural Heritage Digital Library.
- Cresswell, J.W. (2003), *Research Design Qualitative, Quantitative and Mixed Methods Approaches*, Sage Publication, California.
- Creswell, J. W. (1994). *Research Design Qualitative & Quantitative Approaches*, Thousand Oaks, Calif.: Sage Publications, 105
- Davis, H.L. and Somerville, M.M., (2006) "Learning our way to change: improved institutional alignment", *New Library World*, Vol. 107 Iss: 3/4, pp.127 – 140
- Delbridge, R. (2008). An illustrative application of soft systems methodology (SSM) in a library and information service context: Process and outcome. *Library Management*, 29(6/7), 538–555. doi:10.1108/01435120810894545
- Delbridge, R., & Fisher, S. (2007). The use of soft systems methodology (SSM) in the management of library and information services: a review. *Library Management*, 28(6/7), 306–322. doi:10.1108/01435120710774459
- Denzin, N.K. (1970). *The research act: A theoretical introduction to sociological methods*. Chicago: Aldine.
- Delgadillo, R., & Lynch, B. P. (n.d.). Future Historians : Their Quest for Information, 245–259.
- Digital Library Federation. (1998). A working definition of the digital library. Available at: <http://old.diglib.org/about/dldefinition.htm>
- Digital Library Federation. (2002). A working definition of the digital library. Available at: <http://www.clir.org/diglib/dldefinition.htm>

- Documentation, P. I. N. (1999). Research in digital libraries is flourishing all over the world . Many of these research projects are funded by government agencies and national and international bodies , while others are run by specific academic and research institutions and libraries, 55(4), 409–448.
- Downs, R. R., & Friedman, E. a. (1999). Digital library support for scholarly research. *Information Processing & Management*, 35(3), 281–291. doi:10.1016/S0306-4573(98)00062-4
- Drigas, A. S., Tagoulis, A., Nikolopoulos, P., Kalomoirakis, D., Vrettaros, J., Foundation, M. S., & Nera, G. (2005a). A self learning e-system for Greek paleography, 2(8), 1096–1099.
- Drigas, A. S., Tagoulis, A., Nikolopoulos, P., Kalomoirakis, D., Vrettaros, J., Foundation, M. S., & Nera, G. (2005b). An e-learning platform for multiform and interactive education of scholars in Greek Paleography, 2005, 90–94.
- Elliot, A. (2005). Guidelines for Conducting a Focus Group, 1–13.
- Fox, E.A. (1997). Networked Digital Library of Theses and Dissertations: A framework for east-west collaboration. Available at: <http://citeseer.ist.psu.edu/fox97networked.html>
- Fox, E.A. (1999). The 5S framework for digital libraries and two case studies: ND LTD and CSTC. Available at: <http://docs.ndltd.org:8080/dspace/handle/2340/32>
- Gazan, R., (2008). Social annotations in digital library collections. D-Lib Magazine, 1/12(14). Retrieved July 15, 2009 from <http://www.dlib.org/dlib/november08/gazan/11gazan.html>
- Ghani, R.A., Zakaria, M.S., and Omar, K. (2009). Jawi-Malay Transliteration. In Proceeding of International Conference of Electrical Engineering and Informatics (ICEEI) , 5-7 August 2009, 154–157. Available at http://ieeexplore.ieee.org/xpl/freeabs_all.jsp?arnumber=5254799

- Gillet, D., Vu, A., Ngoc, N., & Rekik, Y. (2005). Collaborative Web-Based Experimentation in Flexible Engineering Education, *48*(4), 696–704.
- Gorman, M. (2007). The wrong path and the right path: The role of libraries in access to, and preservation of, cultural heritage. *New Library World*, *108*(11/12), 479–489. doi:10.1108/03074800710838236
- Greenbaum, T.L., 1998. *The Handbook for Focus Group Research*, 2nd Edition. Sage, London
- Harter, S. (1997). Scholarly communication and the digital library: problems and issues. *JoDI (Journal of Digital Information)*, *1*(1). <http://jodi.ecs.soton.ac.uk/Articles/vOl/iOl/Harter/> (visited 5 July 2000). An earlier version of this paper was delivered at KOLISS DL '96: International Conference on Digital Libraries and Information Services for the 21st Century, September 10-13, 1996, Seoul, Korea
- Harvey. (2007). *Descriptive Cataloging for Medieval, Renaissance, and Early Modern Manuscripts*.
- Hernando, S. (1997). Promoting library services to qualified nurses: towards a market-led approach. *Health libraries review*, *14*(2), 105–19. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/10168969>
- Hill, L.L., Carver, L., Larsgaard, M., Dolin, R., Smith, T.R., Frew, J. and Rae, M.A. (2000). Alexandria Digital Library: User evaluation studies and system design. *Journal of the American Society for Information Science*. *51*(3). 246-259
- Hurley, B. (2002). the Director for Library Technologies at U.C.Berkeley. Quoted in *Digital library technology trends*. Sun Microsystems. August 2002
- HyLiFe (2002), “The HyLiFe hybrid library toolkit; information landscapes”, available at: <http://hylife.unn.ac.uk/toolkit/infoland2.html>
- Islamic Heritage Project (2006), Harvard’s Open Collections Program (OCP). Harvard University. Available at: <http://ocp.hul.harvard.edu/ihp/>

- Jermann, P., Soller, A., & Muehlenbrock, M. (2001). From Mirroring to Guiding : A Review of State of the Art Technology for Supporting Collaborative Learning.
- Jenkins, G. M. (1969) The systems approach. In Systems Behaviour (J. Beishon and G. Peters, Eds), 2nd edn, p. 82. Harper & Row, London.
- Johnson, B. R. (1997). Examining the validity structure of qualitative research. *Education*, 118(3), 282-292.
- Jones, R. (1974). More light on malay manuscripts. *Archipel*, 8(1), 45–58.
doi:10.3406/arch.1974.1185
- Keiper, J., Brocks, H., Dirsch-weigand, A., Stein, A., & Thiel, U. (2001). COLLATE – A Web-Based Collaboratory for Content- Based Access to and Work with Digitized Cultural Material, (September), 3–7.
- Kibridge, H.M., DePalo, L. (2001) "The education function in a digital library environment: a challenge for college and research libraries", *The Electronic Library*, Vol.19 No.5 pp283-95
- Kratz. (1981). THE EDITING OF MALAY MANUSCRIPTS, 137, 229–243.
- Lacey, A. and Luff, D. (2009), *Qualitative Data Analysis*, The NIHR RDS for the East Midlands, Nottingham.
- Lecolinet, E., Robert, L., Likforman-Sulem, L., Role, F., & Lebrave, J.-L. (1998). An Integrated Reading and Editing Environment for Scholarly Research on Literary Works and their Handwritten Sources, 144–151.
- Lee, S.H and Boling, E. (1996). Motivational Screen Design Guidelines for Effective Computer-Mediated Instruction. Proceedings of Selected Research and Development Presentations at the 1996 National Convention of the Association for Educational Communications and Technology (18th, Indianapolis, IN, 1996); see IR 017 960

- Lee, L.Z. (2001), "Growing a national learning environment and resources network for science, mathematics, engineering, and technology education: current issues and opportunities for the NSDL program", *D-Lib Magazine*, Vol. 7 No. 3, pp. 65-73.
- Lesser, E., Ransom, D., Shah, R. and Pulver, B. (2012). *Collective Intelligence: Capitalizing on the Crowd*. IBM Global Business Services. USA
- Lewis. (1992). Rich Picture Building in the Soft Systems Methodology. *European Journal of Information Systems* , Vol. 1 (5), 351-360.
- Libraries, C. D. (2010). Andrea Zanni Collaboratory Digital Libraries for Humanities in the Italian context.
- Licklider, J.C.R. (1965). *Libraries of the future*. Cambridge, MA.: The MIT Press.
- Lin, X., & Abels, E. (2010). Digital library education lab, *JELIS*, 51(2), 120-124.
- Lindgaard, G (1994). *Usability Testing and System Evaluation: A Guide for Designing Useful Computer Systems*. First Edition. Chapman & Hall: London, UK
- Madhani, N. (2005). Emily : A Tool for Visual Poetry Analysis.
- Manaf, Z. A. (2008). Establishing the national digital cultural heritage repository in Malaysia. *Library Review*, 57(7), 537–548. doi:10.1108/00242530810894059
- Marchionini, G. & Fox, E. (1999). Progress toward digital libraries: Augmentation through integration (Guest Editors' Introduction). *Information Processing & Management*, 35(3), 219-225
- Masullo, M. and Mack, R. (1996). Roles for digital libraries in K-12 education. *D-Lib Magazine*, September. Available at:
<http://www.dlib.org/dlib/september96/eduport/09masullo.html>
- Mayer, R., & Rauber, A. (2009). Establishing Context of Digital Objects' Creation , Content and Usage.

- McNamara, C. (2009). General guidelines for conducting interviews. Retrieved January 11, 2010, from <http://managementhelp.org/evaluatn/intrview.htm>
- Merriam, Sharan B. (2009). *Qualitative Research: A Guide to Design and Implementation*. John Wiley & Sons, Inc: United States Of America (pp. 203-222).
- Meyyappan, N., Chowdhury, G. G., & Foo, S. (2001). Use of a digital work environment prototype to create a user-centred university digital library. *Journal of Information Science*, 27(4), 249–264. doi:10.1177/016555150102700408
- Ming, D. C. (1981). ACCESS TO MALAY MANUSCRIPTS *.
- Moalla, I., Lebourgeois, F., Emptoz, H., & Alimi, A. M. (2006). Contribution to the Discrimination of the Medieval Manuscript Texts : Application in the Palaeography, 25–37.
- Mouter, N and, Noordegraaf, D.V. (2012). Intercoder Reliability for Qualitative Research: You Win Some, But Do You Lose Some As Well?. TRAIL Research School. The Natherlands.
- Nicolas, S., Paquet, T., & Heutte, L. (2003). Digitizing Cultural Heritage Manuscripts : the Bovary Project, 55–57.
- Nielsen, J. (1990a). Evaluating hypertext usability. In: D. H. Jonassen, & H. Mandl (Eds.), *Designing hypermedia for learning*, Berlin: Springer-Verlag, 147-168.
- Nielsen, J. (1993). *Usability engineering*, Cambridge, MA: AP Professional.
- Nolen, A.L. and, Putten, J.M. (2007). *Action Research in Education: Addressing Gaps in Ethical Principles and Practices*. American Educational and Research Association. SAGE Publications. EDUCATIONAL RESEARCHER 2007 36: 401. DOI: 10.3102/0013189X07309629
- Nor Edzan, C.N. (2007), *Modeling an Information Literacy Programme For Undergraduates: A Soft Systems Methodology Approach*, PhD diss. Faculty of Computer Science and Information Technology, University of Malaya, Malaysia.

- Oh, H. (2006). A Machine Transliteration Model Based on Correspondence between Graphemes and Phonemes, 5(3), 185–208.
- Oldenettel, F., Malachinski, M., & Reil, D. (2005). Integrating Digital Libraries into Learning Environments : The LEBONED Approach.
- Oura J and Kijima K (2002) Organization Design Initiated by Information System Development: A Methodology and its Practice in Japan. Systems Research and Behavioral Science 19 (1), 77-86.
- Palmer, C.L., Teffeau, L.C. and Pirmann, C.M. (2009), “Scholarly information practices in the online environment: themes from the literature and implications for library service development”, OCLC Online Computer Library Center, Dublin, OH, available at: www.oclc.org/programs/publications/reports/2009-02.pdf (accessed 5 April 2009).
- Peacock, J. (2005) "Information literacy education in practice", Developing the New Learning Environment: The Changing Role of the Academic Librarian, pp153-80
- Pesl J, and Hrebicek J .(2003). Soft Systems Methodology Applied to Environmental Modeling. Environmental Informatics, 1:261-266.
- Pinfield, S., Eaton, J., Edwards, C., Russell, R., Wissenburg, A. and Wynne, P. Realizing the hybrid library. D-Lib Magazine, October 1998. Available at: <http://www.dlib.org/dlib/october98/10pinfield.html> (visited 10.12.2010).
- Platt, A and Warwick, S. (1995) "Review of soft systems methodology", Industrial Management & Data Systems, Vol. 95 Iss: 4, pp.19 – 21
- Quesenbery, W. (2003) “Dimensions of Usability: Defining the Conversation, Driving the Process”, in Proceedings of the UPA 2003 Conference. pp. 1-8.
- Rezaei Sharifabadi, S. (2004) "An examination of the role of the university libraries and librarians in the age of digital age", Iranian Journal of Information Science and Technology, Vol.2 No.1 pp73-80

- Raitt, D. (2000) "Digital library initiatives across Europe", *Computer in Libraries*, Vol.20 No.10 pp26-35
- Rifin, M. H., & Zainab, A. N. (2007). Creating a Digital Library to Handle Malay Manuscripts Using Greenstone, 223–231.
- Reed, S. (1992). Who defines usability? You do! *PC/Computing*, 5(12), 220-221, 223-224, 227-228, 230, 232.
- Ritchie, J. & Spencer, L. 1994. Qualitative data analysis for applied policy research" by Jane Ritchie and Liz Spencer in A.Bryman and R. G. Burgess [eds.] "Analyzing qualitative data", 1994, pp.173-194.
- Robertson, J. W. (1994). Usability and children's software: A user-centered design methodology. *Journal of Computing in Childhood Education*, 5(3/4), 257-271.
- Rose, J. (2002), "Interaction, Transformation and information system development – an extended application of Soft System Methodology", *Information Technology and People*, Vol.15 No 3, pp. 242-268.
- Rosenhead, 1989 J. Rosenhead (Ed.), *Rational Analysis for a Problematic World*, Wiley, Chichester (1989)
- Rubin, J. (1994). *Handbook of usability testing: How to plan, design, and conduct effective tests*, New York, NY: John Wiley & Sons.
- Rumpler, B., & Calabretto, S. (1999). Library Review Emerald Article : Virtual library for ancient manuscripts Article information : Virtual library for ancient manuscripts.
- Rusbridge, C. (1998). Towards the hybrid library, 1–17.
- Schwarzwalder, R. (1997a), "Building the digital sci/tech library part 1: the revolutionary's handbook", *Database*, Vol. 20 pp.63-5.
- Schwarzwalder, R. (1997b), "Building the digital sci/tech library part 2: filling the virtual shelves", *Database*, Vol. 20 pp.89-93.

- Schwarzwalder, R. (1997c), "Building the digital sci/tech library part 3: adding electronic services", Database, Vol. 20 pp.65-8.
- Scriven, M. (1991). Evaluation Thesaurus, SAGE Publications: USA.
- Sharifabadi, S. R. (2006a). How digital libraries can support e-learning. *The Electronic Library*, 24(3), 389–401. doi:10.1108/02640470610671231
- Somerville, M. M., & Mirijamdotter, A. (2005). Soft Systems Methodology results transform professional roles in the digital teaching library. In Proceedings of Syllabus Higher Education Technology Conference, July 24-28, Los Angeles, CA.
- Somerville, M. M., & Brar, N. (2009). A user-centered and evidence-based approach for digital library projects. *The Electronic Library*, 27(3), 409–425. doi:10.1108/02640470910966862
- Somerville, M. M., Ph, D., Library, R. E. K., Mirijamdotter, A., & Collins, L. (2006). Systems Thinking and Information Literacy : Elements of a Knowledge Enabling Workplace Environment, 00(C), 1–8.
- Stephane, N., Paquet, T., & Heutte, L. (2004). Enriching Historical Manuscripts : The Bovary Project.
- Szurawitzki, M. (n.d.). Digital Germanic Philology ? Questions , Challenges and Obstacles for Scholars of German, 1–11.
- Tang, T. & McCalla, G. (2005). Smart Recommendation for an Evolving E-Learning System: Architecture and Experiment. *International Journal on E-Learning*, 4(1), 105-129. Norfolk, VA: AACE.
- Teasley, S. and Roschelle, J. (1993). Constructing a joint problem space. In S. Lajoie and S. Derry (Eds.), *Computers as cognitive tools* (pp. 229-257). Hillsdale, NJ: Lawrence Erlbaum.
- Technology, C. (2006). A Machine Transliteration Model Based on Correspondence between Graphemes and Phonemes, 5(3), 185–208.

- Thaller, M. (2009). From the Digitized to the Digital Library, 1–13.
- Uhlir, Z. (2008). Digitization Is Not Only Making Images: Manuscript Studies And Digital Processing of Manuscripts. Knygotyra. Retrieved from <http://www.leidykla.vu.lt/fileadmin/Knygotyra/51/148-162.pdf>
- Wallace, R., Krajcik, J. and Soloway, E. (1996). Digital libraries in the science classroom: An opportunity for inquiry. D-Lib Magazine. September. Available at: <http://www.dlib.org/dlib/september96/umdl/09wallace.html>
- Waters, D.J. (1998). What are digital libraries? CLIR Issues, July/August.
URL:<http://www.clir.org/pubs/issues/issues04.HTML>
- Warwick, J., & South, L. (2008). A Case Study Using Soft Systems Methodology in the Evolution of a Mathematics Module, 5(0), 269–290.
- Witten, H. and Frank, E. (2005). Data Mining: Practical Machine Learning Tools and Techniques. Morgan Kaufmann, San Francisco, 2 edition, 2005.
- Wolf, A., Manduca, C., Morgan, G., & Mcmartin, F. (2007). Use of Online Digital Learning Materials and Digital Libraries : Comparison By Discipline, 500.
- Yin, R. K. (2003). Case study research: Design and methods (3rd ed.). Thousand Oaks, CA: Sage.
- Zainab, A.N, Abdullah, A. and Anuar, N.B. (2003). Inculcating ICT Skills through a collaborative digital library initiative for educational use. Paper presented at the 6th International Conference of Asian Digital Libraries(ICADL 2003), Kuala Lumpur, Malaysia, 8-11 Dec. LNCS 2911.(p. 489-492). Springer-Verlag
- Zainab, A.N., Abrizah, A. & Hilmi, M.R. 2009. What a digital library of Malay manuscripts should support an exploratory needs analysis. Libri, 59, 275-289

APPENDICES

APPENDIX A

A LETTER TO APM FOR CLASS OBSERVATIONS



Producing Leaders Since 1905



30 Disember 2009

Ybhg. Profesor Madya Datuk Zainal Abidin Borhan,
Pegawai Akademik Pengajian Melayu,
Universiti Malaysia

Per: Meminta Kebenaran Untuk Mengikuti Kelas Filologi Bagi Memenuhi Kajian Keperluan Untuk Sistem "E-Learning for Malay Manuscript Studies"

Saya merupakan calon doktor falsafah dari Fakulti Sains Komputer dan Teknologi Maklumat. Kajian saya adalah untuk Membangunkan modul E-pembelajaran untuk menampung keperluan pengajaran dan pembelajaran manuskrip Melayu.

Bagi menjayakan objektif projek ini, saya telah menebual beberapa orang pensyarah di Akademi Pengajian Melayu dan Prof Madya Dr. Zahir bin Ahmad merupakan salah seorang daripadanya. Beliau telah mencadangkan supaya saya mengikuti kelas Pengantar Filologi di bawahnya bagi membantu penyelidikan saya ini.

Cadangan ini telah saya rujuk kepada penyelia saya, dan beliau amat menyokong cadangan ini. Sebaik sahaja saya mendapat persetujuan dari pihak Tuan saya akan mengikuti kelas Filologi bersama-sama pelajar lain yang mengikuti kelas tersebut. Buat pengetahuan Tuan, saya hanya akan menghadiri kelas dan melihat cara pembelajaran mereka tanpa terlibat dengan apa jua tugas yang berkaitan kelas tersebut. Sekiranya perlu saya menemubual atau bertanyakan soalan berkaitan kajian saya, saya akan lakukan di luar waktu kuliah.

Semoga Tuan bersetuju membantu dalam projek ini demi kebaikan pengajian manuskrip Melayu.

Yang benar,


ZAHIDAH BINTI ZULKIFLI
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Disahkan oleh,

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APPENDIX B

LECTURER INTERVIEW PROTOCOL

Name of participant :
Place :
Date/Day :
Time/Duration :
Interview Objective :

INTERVIEW PROTOCOL

Guide to interview	Researcher's note	Researcher's Comments
		Issues/ Reflection
<p>Part A: Getting started -</p> <p>1) Rapport building</p> <ol style="list-style-type: none">1. Duration of involvement in Malay manuscripts2. His profession background3. Personal Background of participant4. Academic background5. Leisure/Recreation <p>2) Research/Interview Objectives:</p> <ol style="list-style-type: none">1. To extract the process and problem information within the context of teaching and learning Malay manuscript2. Experiences on handling Malay manuscripts3. To see their views on the Malay manuscripts that available online		

<p>Part B: <i>Probing</i> Conversation based on your observation at research site. Give attention to the participant's response to guide you in the interviewing process.</p> <p>This part will be cosentrating on the Malay manuscripts teaching and learning based on his experiences</p> <ol style="list-style-type: none"> 1. what is the context of manuscripts use in the teaching and learning of classical Malay literature? 2. Who are the stakeholders in the teaching and learning situation of Malay manuscripts? 3. How are the contents of the manuscripts used and for what purposes? 4. How can the electronic environment make manuscript studies more conducive and helpful? 5. When do the students and instructors need to use Malay manuscripts? What is the motivation to use? 6. What are the problems encountered by instructors and learners of Malay manuscripts? 7. Basically, what is the process for users to study and understand Malay manuscripts? <p>Part C : Concluding the interview</p> <p><u>Additional information</u> This part will be concentrating</p>		
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<p>on the e-learning of Malay manuscripts. The participant's view and self experiences with technologies. The questions must be included these:</p> <ol style="list-style-type: none"> 1. In your opinion, can electronic learning help users of Malay manuscripts works become easier? 2. Currently, is there any current electronic system (at your place) that is being used by Malay manuscripts users? 3. If there is any, how does it help the users and how is the users' acceptance? 4. In your opinion, what are the important criteria that should have in the e-learning Malay manuscript system? <p><u>Appreciation</u></p> <ol style="list-style-type: none"> 1. end up the conversation with the summary of the whole interview (based on what i have written) 2. reconfirm on the things that we are not so sure 3. show appreciation by saying thanks and if possible bring him a gift <p>ask him whether is it possible to further the interviews in the future. This is important in case the data collected are not enough.</p>		
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APPENDIX C

STUDENTS' FOCUS GROUP CONFIRMATION LETTER & CONSENT TO PARTICIPATE IN FOCUS GROUP

Focus Group Confirmation Letter

4 September 2009

Dear _____,

Thank you for your willingness to participate in our focus group. As discussed, we would like to hear your ideas and views about your experiences in teaching and learning environment for Malay manuscript studies. You will be in a group with 7-9 other students. Your responses to the questions will be kept anonymous. The date, time and place are listed below.

Date	4 September 2009
Time	11.00am – 1.00pm
Place	8 th College, University Malaya

If you need directions to the focus group or will not be able to attend for any reason please call 012-7150336. Otherwise we look forward to seeing you.

Sincerely,
ZahidahZulkifli

Consent to Participate in Focus Group

You have been asked to participate in a focus group conducted by Miss Zahidah Zulkifli who is currently doing research in Malay Manuscript studies. The purpose of the group is to try to understand the Malay manuscript studies in Akademi Pengajian Melayu. The information learned in the focus groups will be used to design an electronic learning system to Malay manuscript teachers, students and researchers.

You can choose whether or not to participate in the focus group and stop at any time. Although the focus group will be tape recorded, your responses will remain anonymous and no names will be mentioned in the report.

There is no right or wrong answers to the focus group questions. We want to hear many different viewpoints and would like to hear from everyone. We hope you can be honest even when your responses may not be in agreement with the rest of the group. In respect for each other, we ask that only one individual speak at a time in the group and that responses made by all participants be kept confidential.

I understand this information and agree to participate fully under the conditions stated above:

Signed: _____ Date: _____

APPENDIX D

STUDENTS' FOCUS GROUP PROTOCOLS

Focus Group Introduction

WELCOME

Thanks for agreeing to be part of the focus group. We appreciate your willingness to participate.

INTRODUCTIONS

Moderator

PURPOSE OF FOCUS GROUP

The reason we are having these focus groups is to find out the current Malay manuscript studies in Akademi Pengajian Melayu. We need your input and want you to share your honest and open thoughts with us.

GROUND RULES

1. WE WANT YOU TO DO THE TALKING.
We would like everyone to participate.
I may call on you if I haven't heard from you in a while.
2. THERE ARE NO RIGHT OR WRONG ANSWERS
Every person's experiences and views are important.
Speak up whether you agree or disagree.
We want to hear a wide range of views.
3. WHAT IS SAID IN THIS ROOM STAYS HERE
We want folks to feel comfortable sharing when sensitive issues come up.
4. WE WILL BE TAPE RECORDING THE GROUP
We want to capture everything you have to say.
We don't identify anyone by name in our report. You will remain anonymous.

APPENDIX E

PROTOCOL FOR OBSERVATION

Guidelines:

- 1) The objective/focus of your observation is to get as much detail (thick description) as possible.
- 2) Avoid making a summary/evaluation when observing.
- 3) Record what you see and what you hear – focus on the events / activities, people, & place. Should you have any comments/opinion etc., note that as observer's comment.
- 4) However, this protocol is only a guide. You must give allowance for emerging issues/events/ideas.
- 5) You are also encouraged to write as question/s that you want to ask in your interview. Questions that will provide you with more detail/clarification on your observation.

Background Information

Name: ZahidahbintiZulkifli

Name of place of observation: Tutorial Class of 'PengantarFilologi' subject in Academy of Malay Studies

Name of participation/ people involved: Lecturer: Prof Dr Abu Hassan Mohd Sham

Students: Students of 'PengantarFilologi' for semester 2, 2009/2010 session

Topic of observation: to observe how the students and lecturer do their teaching and learning of Malay manuscripts inside of the classroom.

Date/day: 12 January 2010 – 6 April 2010

Time: Every Tuesday, from 11am to 1 pm

No. of observation: 14 times

Guidelines	Observation notes (which include observer's comment/s)	Observer's notes/reflection
<p>Description of the following:</p> <p>1. Place/surrounding, environment, ambience and facilities:</p> <p>a) Place/Surrounding</p> <ul style="list-style-type: none"> - Where is the observation take place - The detail description of the location (in what level, in the class/the end of the building etc) - Draw a plan of the classroom - Size of the classroom - The classroom's building is surrounded of what? - Decoration of the classroom <p>b) Environment</p> <ul style="list-style-type: none"> - The classroom is situated in the town/village/urban area? - Noisy/quiet? - Whether of the day? Time of the class started (it may brings effect on the participants' mood) <p>c) Ambience</p> <ul style="list-style-type: none"> - Mood of the whole classroom - Overall character of the participants <p>d) Facilities</p> <ul style="list-style-type: none"> - Describes the furniture (lecturer's table and chair, students' table and chair) - List of facilities that are provided for lecturer only - List of facilities that are provided for students only - Electronic devices that are available (projector, TV, personal computer etc) - Basic facilities (number and design) e.g. fan, lamp, air conditioner) 		

Guidelines	Observation notes (which include observer's comment/s)	Observer's notes/reflection
<p>2. People- primary and secondary participants</p> <p>a) Lecturer</p> <ul style="list-style-type: none"> - Physical of the lecturer (what is he/she wearing on that day) - Overall appearance (age, tall/short? Fat/slim? Dark/fair?) - Behavior (punctuality, soft/harsh) - His/her action (the way he/she moves) - Is he/she attractive or not? Is he making the class interesting? - Additional things that she/he use to support his/her teaching (chart/diagram/graph/books/attractive manuscripts) <p>b) Students</p> <ul style="list-style-type: none"> - Number of students - Races (number) - Gender (number) - Is there any students that are disable etc - (If any, is there any special facilities provided for him/her?) - How the students dressed up? - How they communicate with the lecturer/other students? - Are they giving a full attention to the lecture given? - Are they looking comfortable in the class? 		
Guidelines	Observation notes (which include observer's comment/s)	Observer's notes/reflection
<p>3. Events</p> <p>a) Teaching</p> <ul style="list-style-type: none"> - the detail process of teaching from the class started until the end - chapters/topics covered on that day 		

<ul style="list-style-type: none"> - how the lecturer communicate with the students (asking questions or just giving lecture?) <p>b) Learning</p> <ul style="list-style-type: none"> - What the students do while listening to the lecture? (jot down notes? Doing nothing? Playing around?) - How frequent questions being asked? - The relationship between student and lecturers/among the students 		
Guidelines	Observation notes (which include observer's comment/s)	Observer's notes/reflection
<p>4. Activities</p> <p>a) Lecturing</p> <ul style="list-style-type: none"> - How the lecturers conduct the lecture? - Besides giving the lecture, is he/she use any other thing to help in his/her lecture? <p>b) Test/quiz/examination</p> <ul style="list-style-type: none"> - Is there any quiz/test that is conducted on that day? If any, how it is being conducted? <p>c) Presentation</p> <ul style="list-style-type: none"> - How many students that are doing presentation on that day? - Is it by group or individual? - What are the contents of each presentation? - Is there any particular guidelines/terms that the students must followed in doing the presentation (format) - How are the marks given? <p>d) Questions & Answers Session Communication between students and lecturer</p> <ul style="list-style-type: none"> - What questions and answers that had been raised on that day? - Are there any questions/answers 		

<p>that do not solved?</p> <ul style="list-style-type: none"> - Are they any issues that being raised? - How many questions/answers that being raised on that day? <p>e) Summary of the lecture of that day</p> <ul style="list-style-type: none"> - Draw a flow chart that describes the whole process of the lecture on that day 		
Guidelines	Observation notes (which includes observer's comment/s)	Observer's notes/reflection
<p>5. Subtle factors</p> <p>Conclusion:</p> <ul style="list-style-type: none"> • A summary of your observation • Your impression • Appreciation to your participant/s 		
Guidelines	Observation notes (which includes observer's comment/s)	Observer's notes/reflection

--	--	--

Beginning of the class/lesson;	Responses (answer/asking question): Participation:
In the middle of teaching and learning process.	Responses (answer/asking question): Participation:
End of the class:	Responses (answer/asking question): Participation:

APPENDIX F

GUIDELINE FOR MALAY MANUSCRIPTS E-WORKSPACE USABILITY TESTING

FSKTM, UM

Malay Manuscript E-Workspace

Pengujian Sistem

Arahan:

Bagi menjayakan proses pengujian sistem ini, anda diminta mengikut langkah-langkah yang diberikan. Masa yang diberikan 1 jam. Tiada jawapan betul atau salah. Sila bertanya kepada *moderator* sekiranya ada soalan atau perlukan bantuan

1. Sila buka pelayar internet anda seperti Internet Explorer, Firefox atau Chrome.
Untuk mendapatkan view yang paling sesuai, kami sarankan untuk menggunakan Google Chrome sebagai pelayan internet anda.
2. Taipkan alamat ini : <http://sothye.ridinglinux.org/moodle19/> . Skrin seperti dibawah akan dipaparkan.
3. Setiap pelajar akan diberikan nama pengguna dan kata laluan .

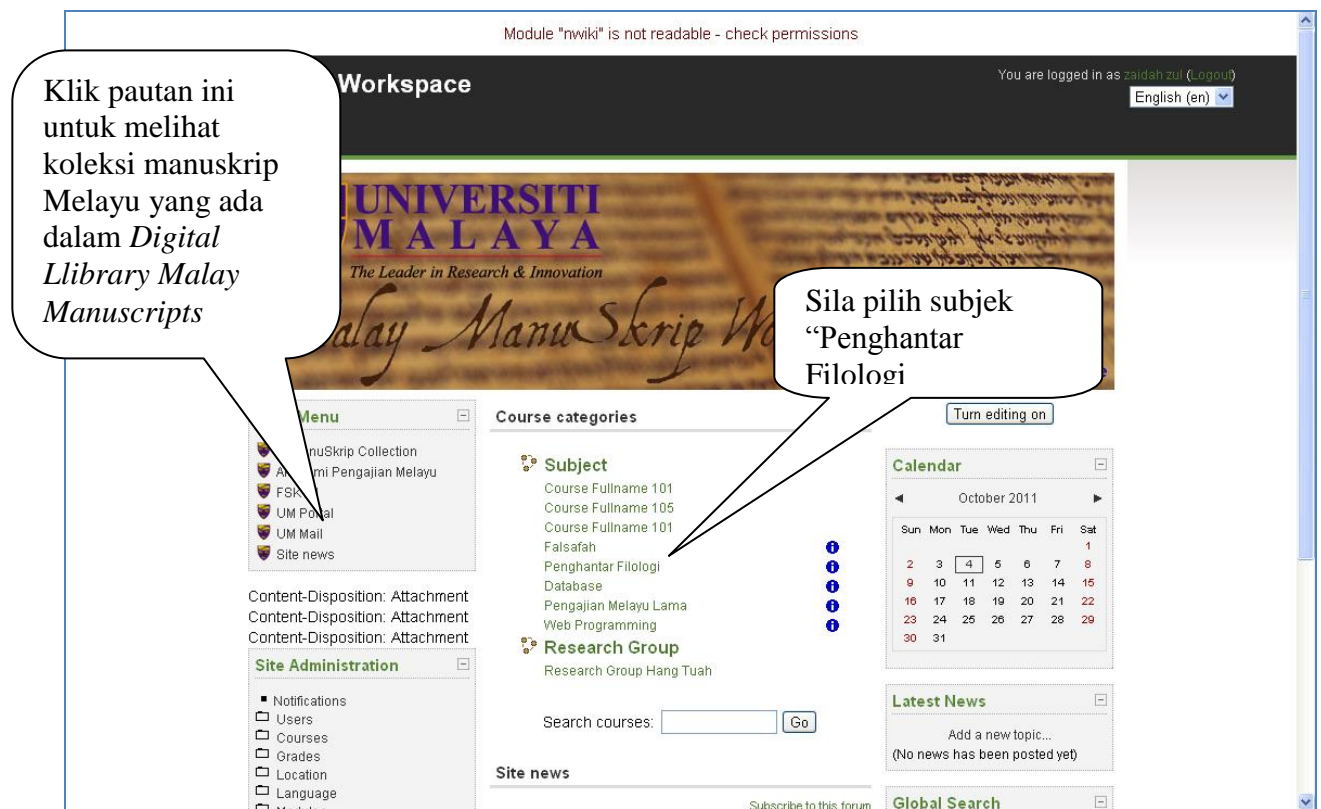
Modul Log-in

The screenshot shows the 'Malay ManusKrip Workspace' login interface. At the top, it says 'Research Centre' and 'You are not logged in. (Login)'. Below this is a banner for 'UNIVERSITI MALAYA' with the tagline 'The Leader in Research & Innovation' and 'Malay ManusKrip'. The main content area is divided into several sections: a login form on the left, a 'Course categories' list in the center, and a calendar on the right. The login form has fields for 'Username' and 'Password', a 'Login' button, and a link for 'Lost password?'. The 'Course categories' list includes 'Subject' (with sub-items like 'Course Fullname 101', 'Course Fullname 105', 'Falsafah', 'Penghantar Filologi', 'Database', 'Pengajian Melayu Lama', 'Web Programming') and 'Research Group' (with 'Research Group Hang Tuah'). A search bar for 'Search courses' is at the bottom of the categories list. The calendar shows the month of October 2011. There are also sections for 'Main Menu' (with links like 'MyManusKrip Collection', 'Akademi Pengajian Melayu', 'FSKTM', 'UM Portal', 'UM Mail', 'Site news'), 'Latest News' (with '(No news has been posted yet)'), and 'Global Search' (with a 'Find' button). Two callout boxes provide instructions: one points to the login form saying '1. Sila log in menggunakan username dan password yang telah diberikan' and the other points to 'Penghantar Filologi' in the subject list saying '2. Sila klik pada subjek "penghantar filologi"'. The 'Site news' section at the bottom also states '(No news has been posted yet)'.

1. Sila log in menggunakan username dan password yang telah diberikan

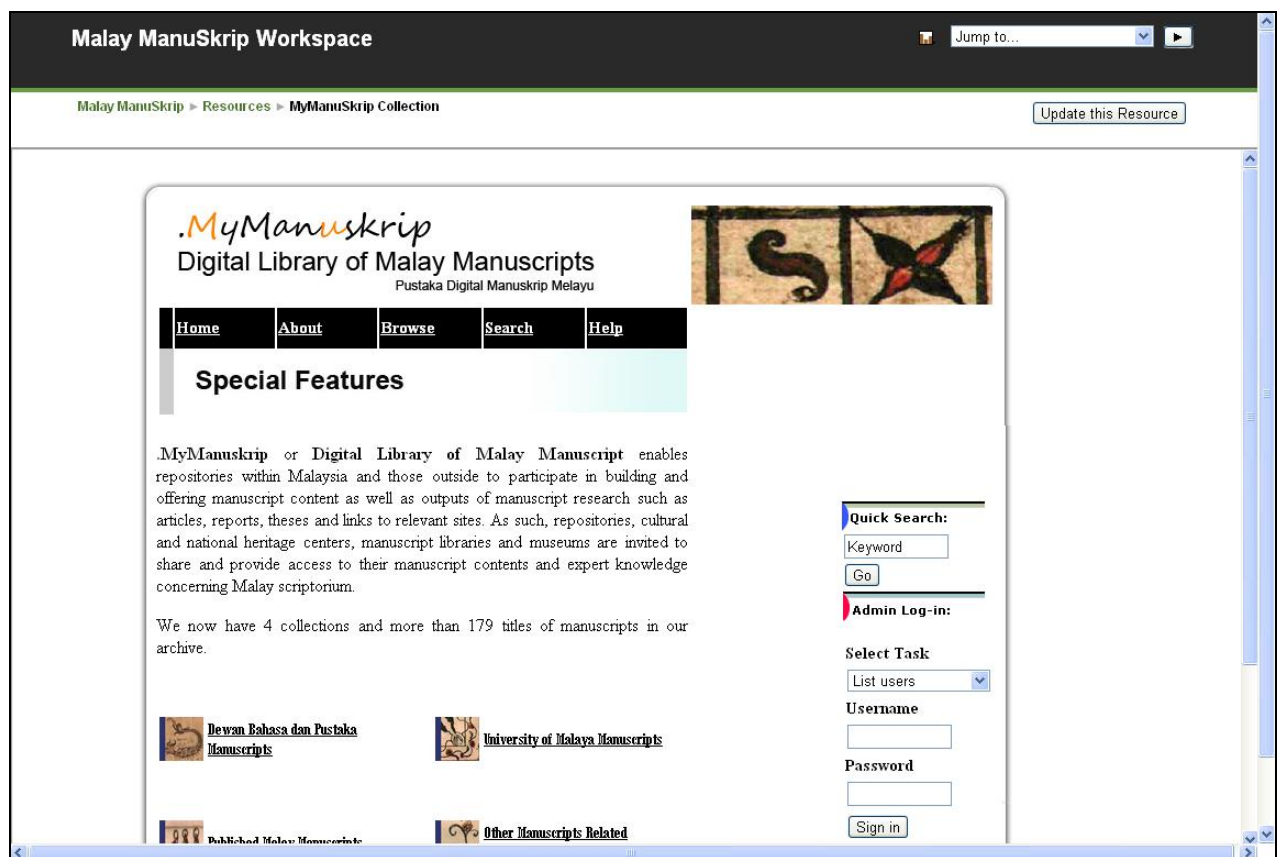
2. Sila klik pada subjek "penghantar filologi"

Rajah 1: Paparan Utama



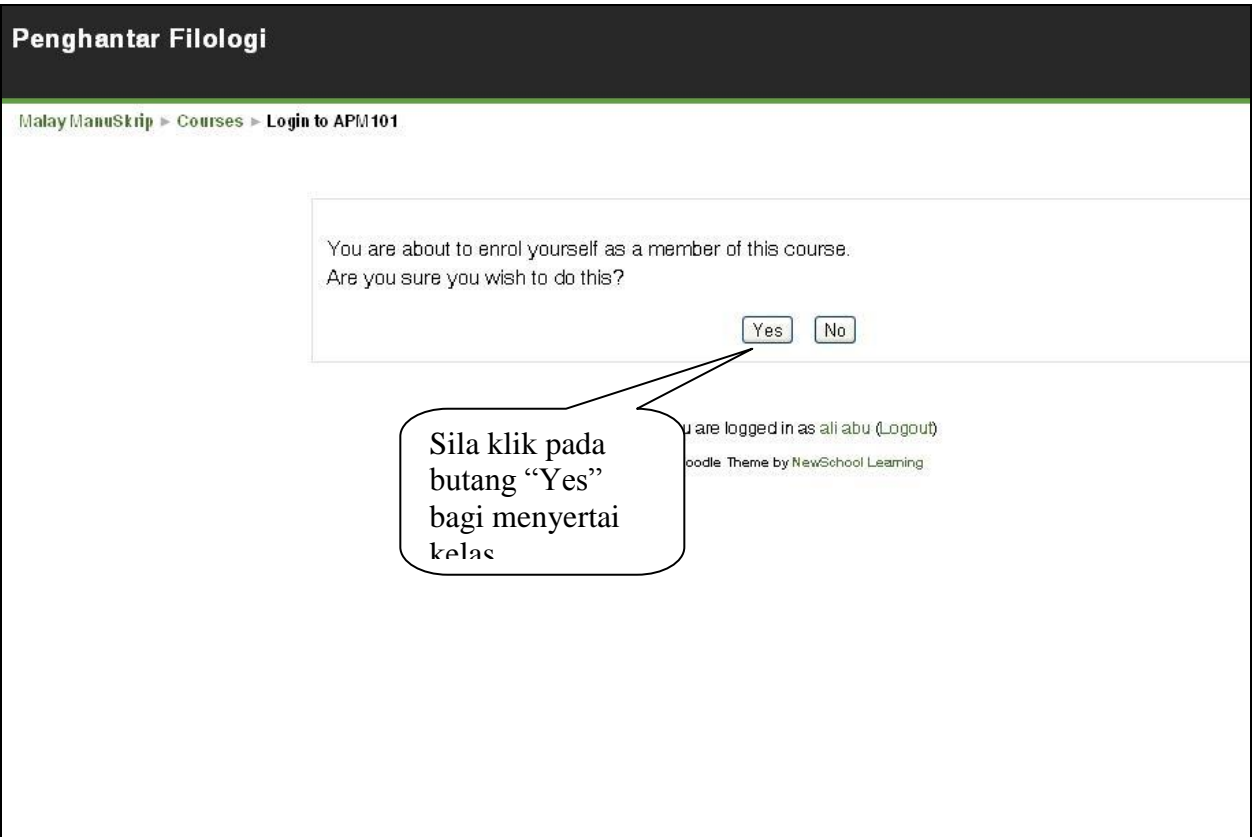
Rajah 2: Paparan setelah anda menyertai

4. Sistem ini menyediakan pautan terus ke sistem *MyManuskrip* (Digital Library of Malay Manuscripts) di mana pengguna boleh menggunakan servis ini sebagai sumber utama manuskrip Melayu.



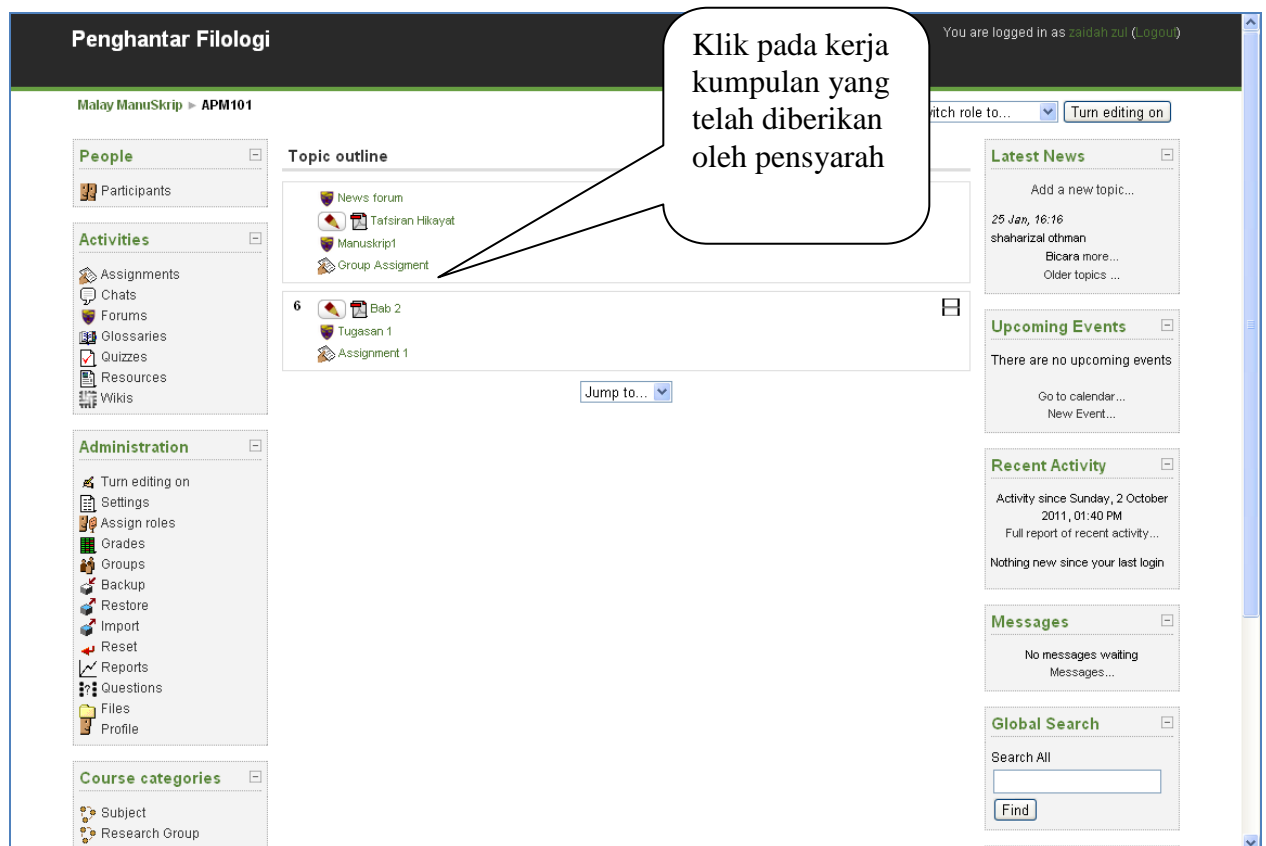
Rajah 3: Pautan terus ke sistem *MyManuskrip*

5. Paparan ini akan dilihat sekiranya pelajar kali pertama menyertai course tersebut



Rajah 4: Paparan bagi menyertai kelas

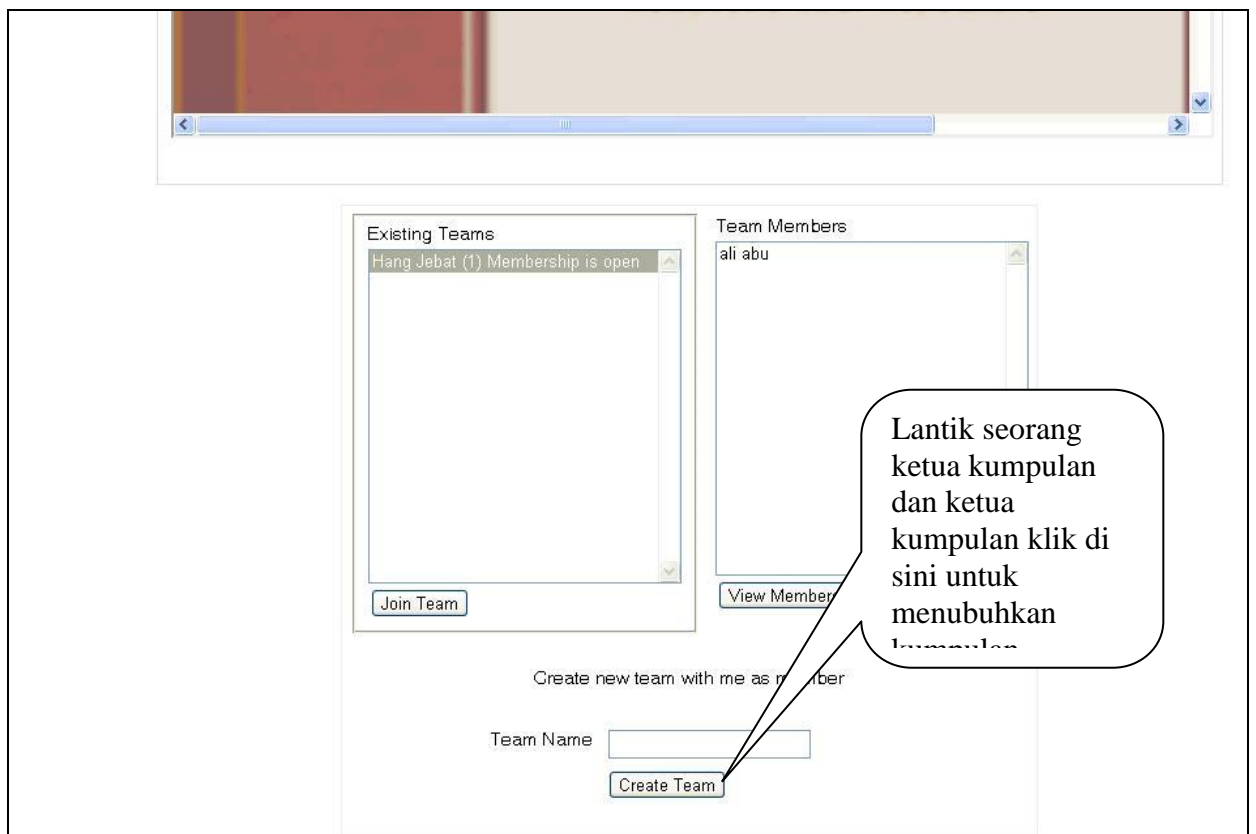
6. Pensyarah akan memberikan semua tugas di ruangan ini. Bagi kes ini, pelajar akan diberikan tugas seminggu sekali.
7. Dalam ruangan "topic outline" di bawah, semua dokumen, tugas atau nota dalam minggu tersebut akan dimuat naik oleh pensyarah untuk dikongsi bersama pelajar sebagai rujukan.



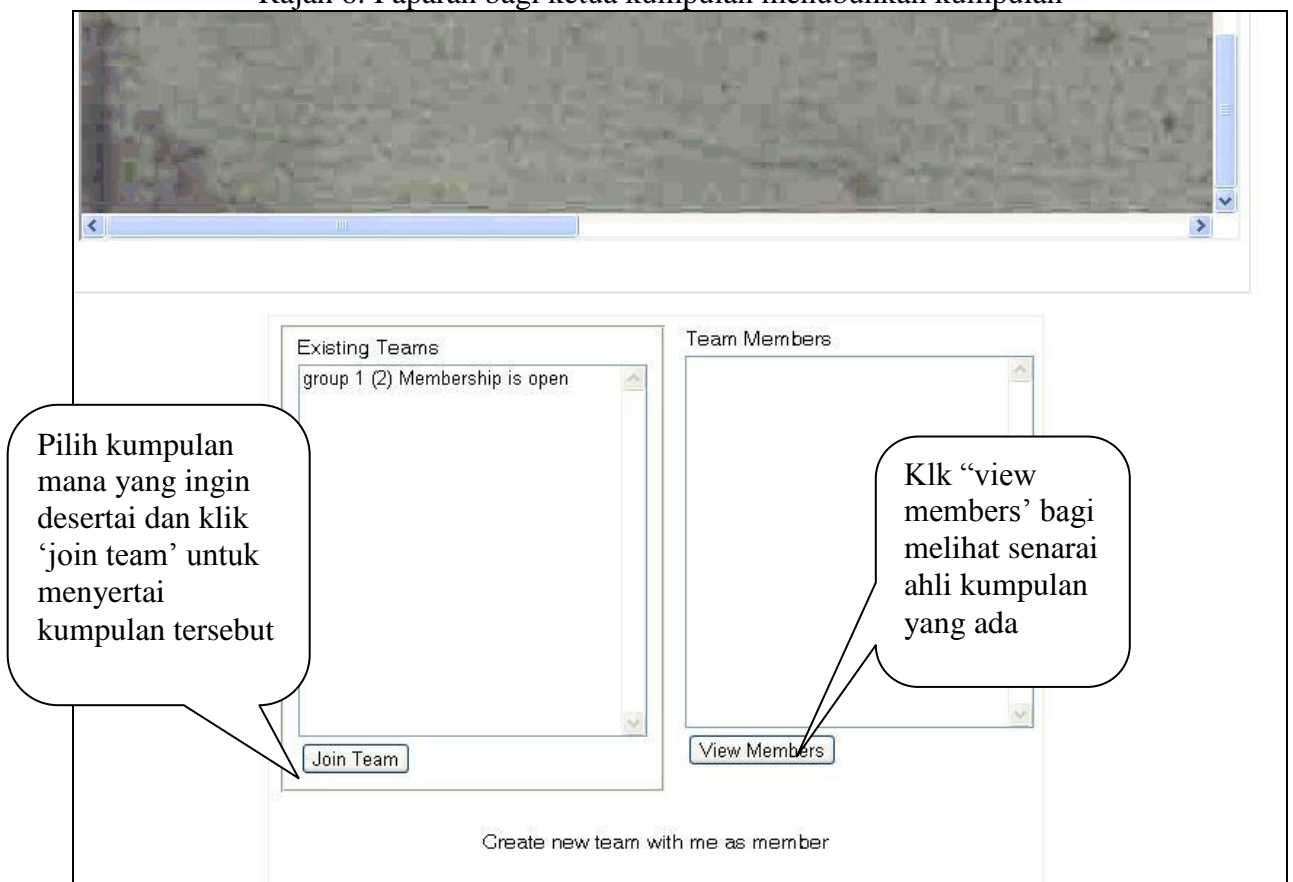
Rajah 5: Paparan menunjukkan tugasan yang telah diberikan oleh pensyarah

Modul Create group

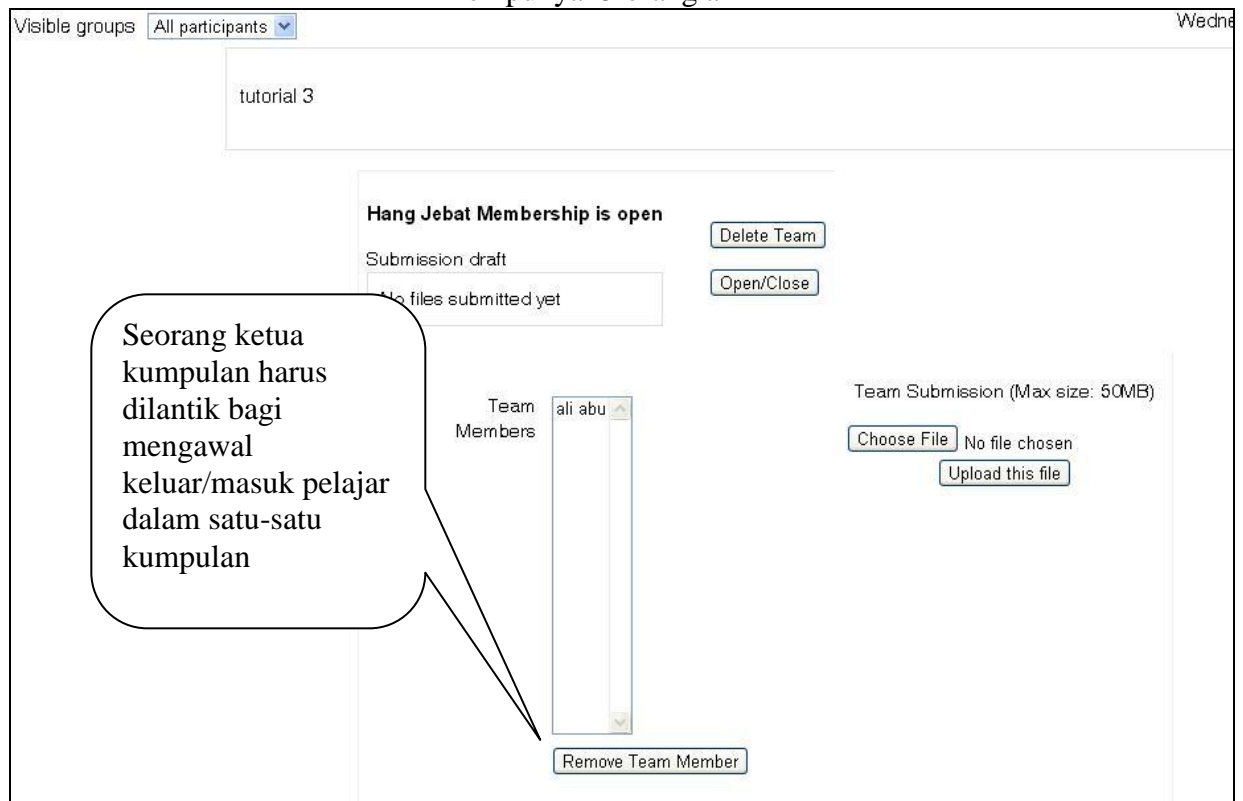
8. Lantik seorang ketua dalam kumpulan berlima. Ketua kumpulan diminta untuk menubuhkan kumpulan dengan meletakkan nama kumpulan dan menambah ahli kumpulan.
9. Senarai nama pelajar akan terpapar dan ketua kumpulan hanya perlu memilih nama pelajar dalam kumpulannya



Rajah 6: Paparan bagi ketua kumpulan menubuhkan kumpulan



Rajah 7: paparan bagi membuat kumpulan. Dalam kes ini, setiap kumpulan harus mempunyai 5 orang ahli



Rajah 8: paparan bagi ketua kumpulan mengeluarkan pelajar dalam kumpulan

10. Setelah kumpulan ditubuhkan, klik pada tugas tadi dan paparan seperti dalam Rajah 7 akan ditunjukkan. Dalam kes ini, manuskrip tersebut telah dipilih oleh pensyarah dan setiap pelajar/kumpulan akan melakukan tugas ke atas manuskrip yang sama.
11. Perbincangan dibuat menggunakan annotation tools yang disediakan . segala perbincangan boleh di retrieve kembali sebagai rujukan dan juga rujukan kepada pelajar yang tidak dapat menyertai perbincangan pada masa tertentu

Modul annotation

The screenshot displays the A.nnotate web application. At the top, it shows 'Separate groups: All participants' and the date 'Thursday, 2 June 2011, 11:34 AM'. The main area features a document titled 'Hikayat_Ayob.pdf' with Arabic calligraphy. A yellow annotation box is visible on the document. To the left of the document, there is a text input field with the placeholder 'Enter your email to add comments.' and a 'Login' button. Below the document, there is a 'Submission*' section with a text area containing the text 'nama : shaharizal' and 'nama : atik'. At the bottom of the submission section, there is a 'Path:' field, a 'Format' dropdown menu set to 'HTML format', and 'Save changes' and 'Cancel' buttons. A red error message at the bottom right states 'There are required fields in this form marked*.'

Sila rujuk pada manuskrip yang telah dipilih oleh pensyarah.

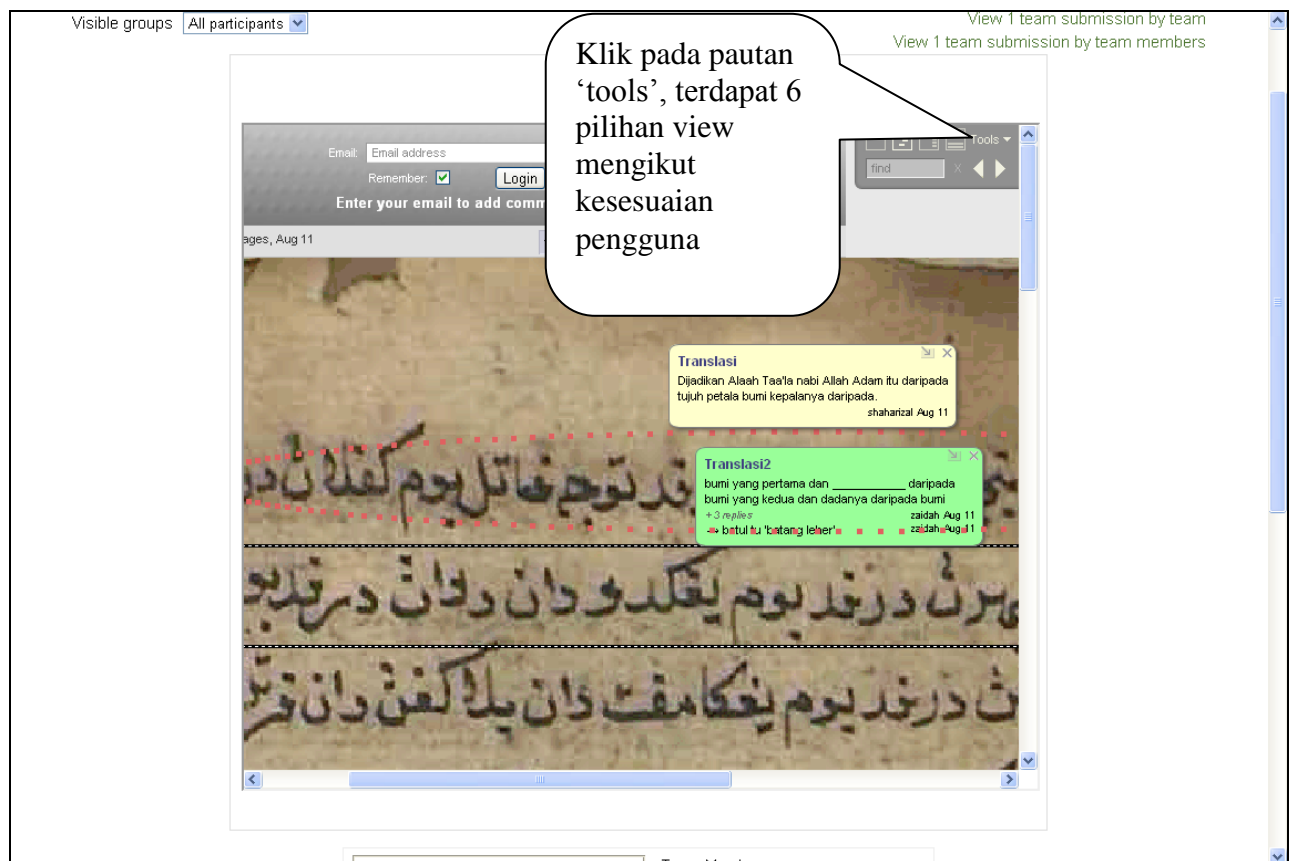
Sila buat perbincangan dengan menggunakan tools yang disediakan

Sila taip tugas anda disini

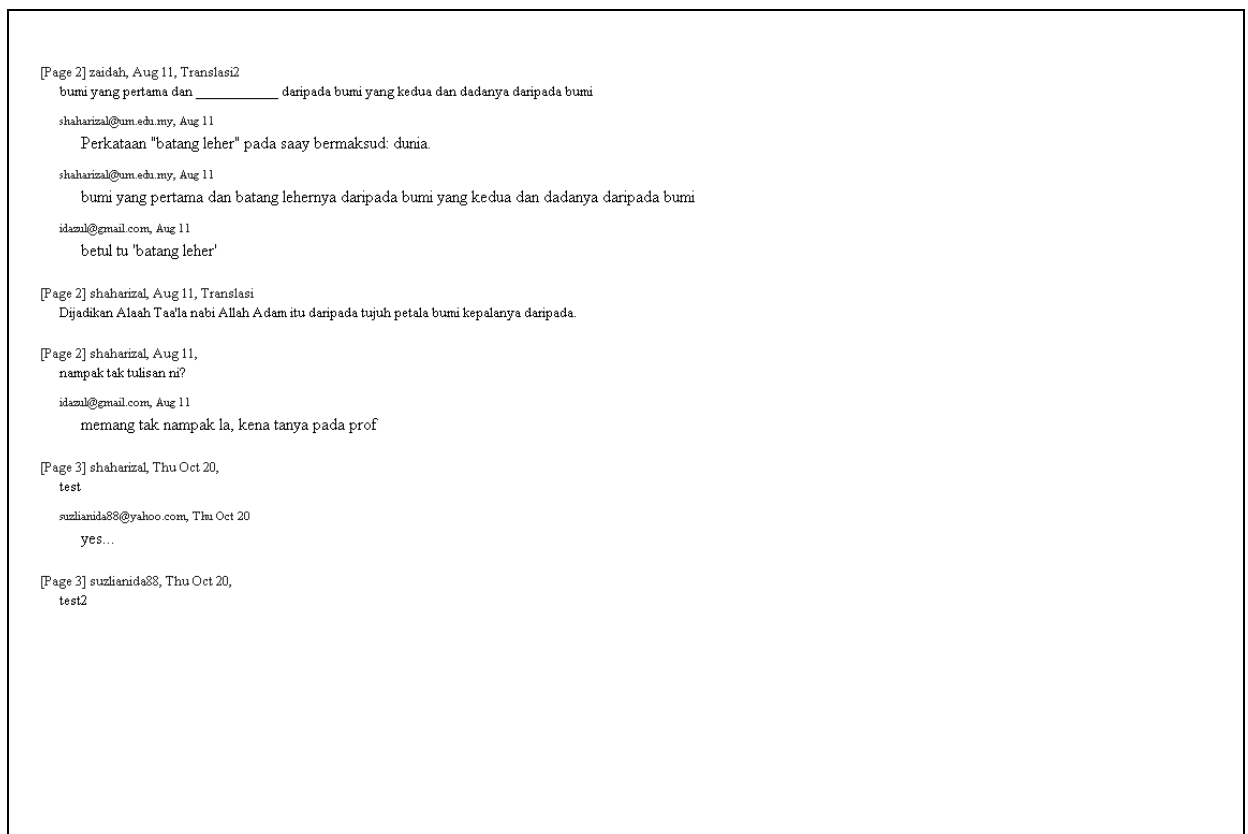
Rajah 9: Paparan di mana perbincangan dilakukan

12. Pada pautan 'tools' seperti yang ditunjukkan dalam rajah di bawah, terdapat 6 pilihan view pengguna, iaitu:

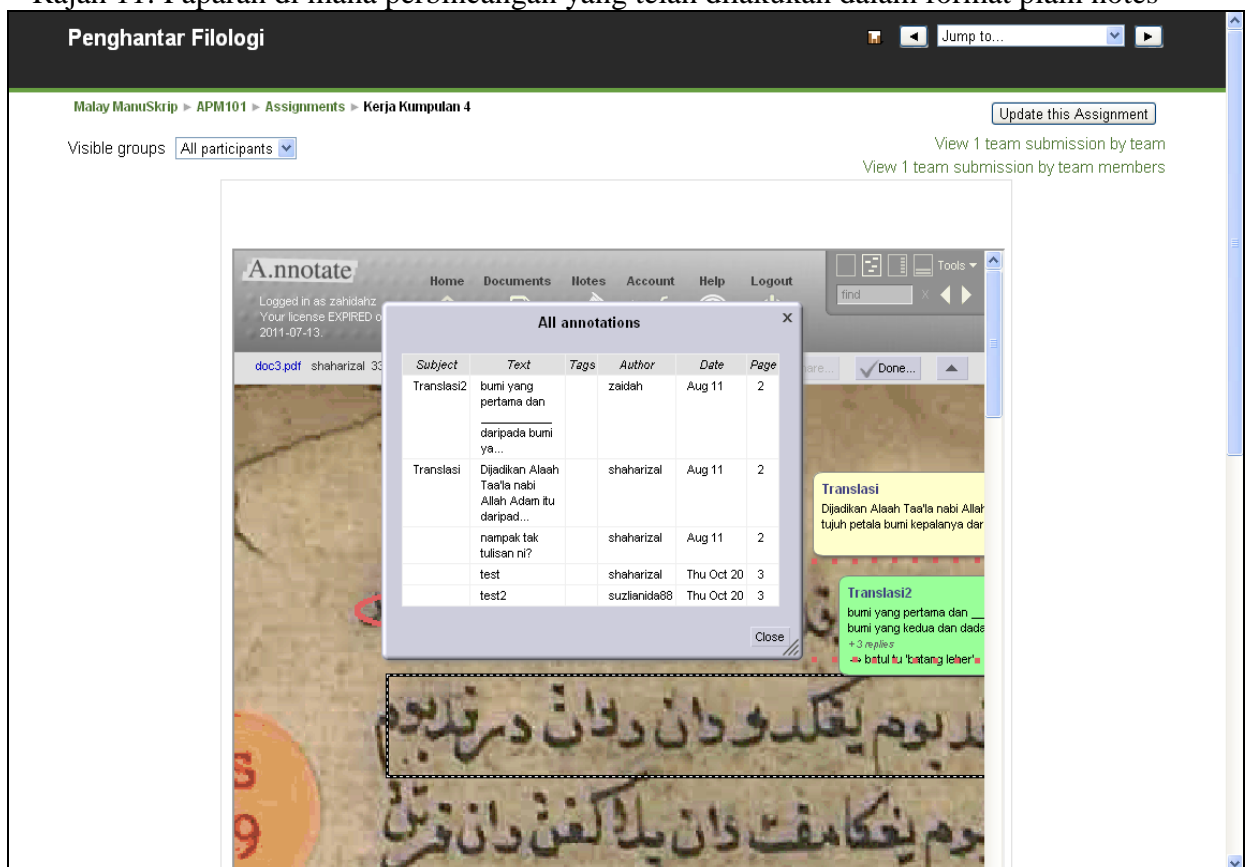
- Properties – bagi mengetahui secara terperinci manuskrip yang sedang dipaparkan
- Clipboard – pengguna boleh ‘copy’ dan ‘paste’ sebarang dokumen dalam manuskrip asal ke dalam clipboard
- Colors – pilihan warna untuk ‘dialog box’ (box semasa proses annotation) dan ‘notes’ (warna tulisan semasa proses annotation)
- Plain notes – paparan semua hasil annotation yang telah dilakukan beserta dengan keterangan terperinci seperti masa dan nama author. Boleh dijadikan sebagai salah satu format tugas dihantar kepada pensyarah (Rujuk Rajah 11)
- All notes – paparan semua hasil annotation yang telah dilakukan tetapi dalam bentuk jadual beserta dengan keterangan terperinci seperti masa dan nama author (Rujuk Rajah 12)
- Export – paparan akan dihasilkan dalam bentuk pdf dan juga boleh dijadikan sebagai salah satu format tugas dihantar kepada pensyarah (Rujuk Rajah 13)



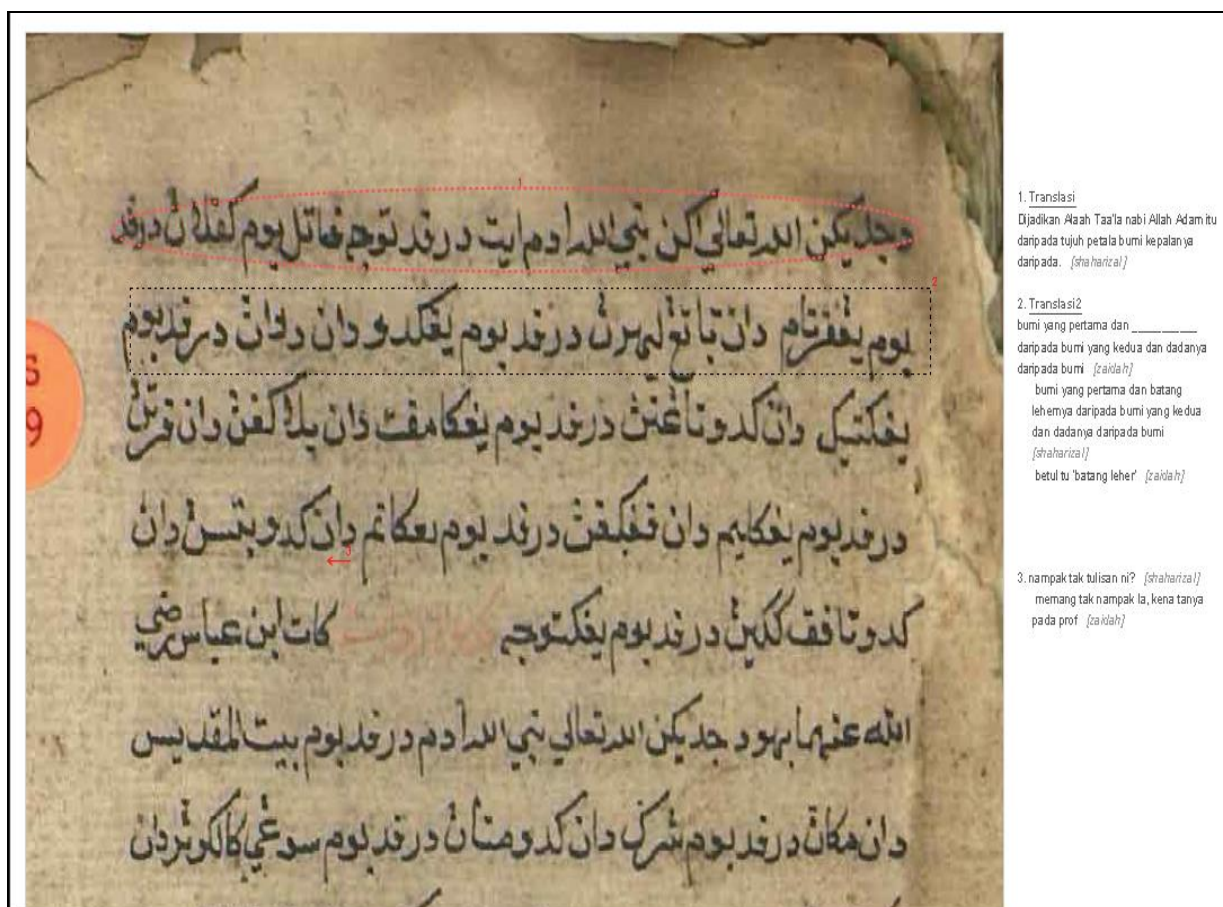
Rajah 10: Paparan menunjukkan perbincangan dalam kumpulan sedang dijalankan



Rajah 11: Paparan di mana perbincangan yang telah dilakukan dalam format plain notes



Rajah 12: Paparan di mana perbincangan yang telah dilakukan dalam format all notes



Rajah 13: Paparan di mana perbincangan yang telah dilakukan dalam format pdf

Modul transliterasi

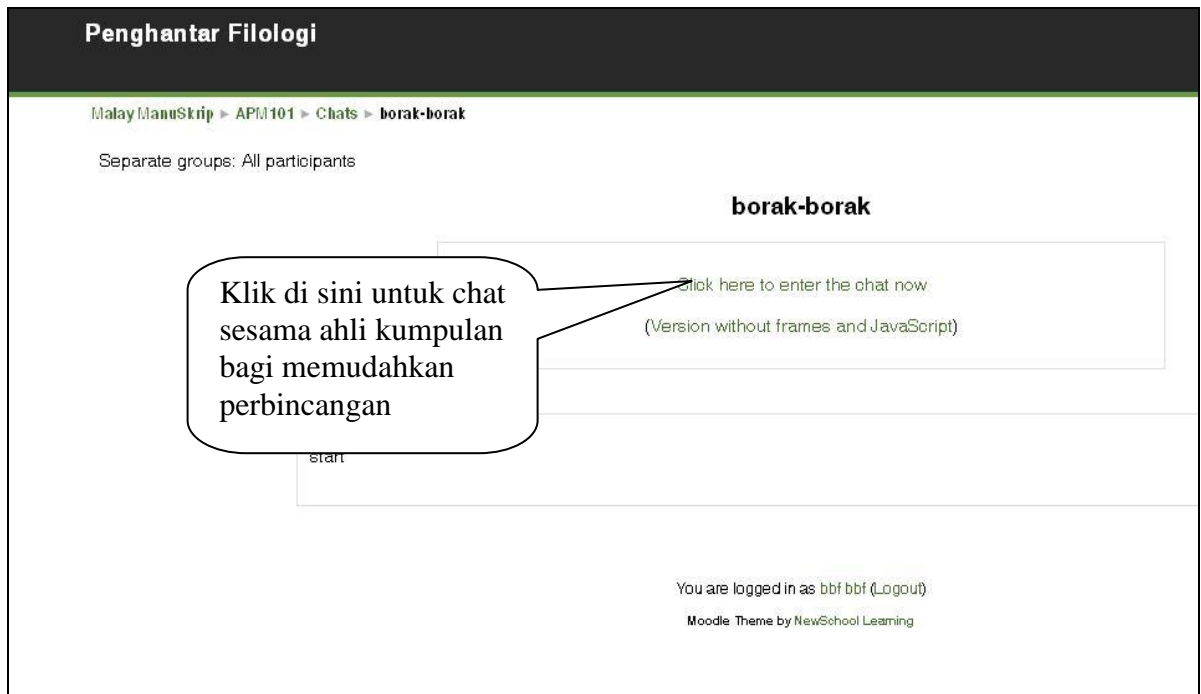
13. Text editor seperti dalam Rajah 14 di bawah adalah tempat di mana pelajar menaip manuskrip yang telah ditranliterasi. Semua ahli kumpulan akan melihat paparan yang sama, dan mereka dapat mengemaskini bersama-sama dari semasa ke semasa.

The screenshot shows a web-based text editor interface. At the top, there is a red label "Submission*" with a warning icon. Below this is a text editor with a toolbar. The toolbar includes options for font face (Trebuchet), font size (3 (12 pt)), language (Lang), and various text formatting tools (bold, italic, underline, strikethrough, text color, background color, bulleted list, numbered list, link, unlink, undo, redo). The text area contains the following text: "nama : shaharizal", "nama : atik", and "hikayat hang tuah". Below the text area is a path indicator "Path: body > div" and a "Format" button. At the bottom, there are "Save changes" and "Cancel" buttons. A red message at the bottom right states "There are required fields in this form marked*.". A speech bubble points to the "Save changes" button with the text "Klik di sini setelah setiap kali tugas dikemaskini".

Rajah 14: Paparan di mana tugas dilakukan

Modul chat

14. Kemudahan chat disediakan bagi ahli kumpulan berbincang sama ada semasa tugas dilakukan atau tidak







Rajah 15: Paparan “Chat” di mana pelajar dapat berkomunikasi sesama ahli kumpulan

Pengantar Filologi

MalayManuskrip > APL1101 > Chats > borak-borak > Chat sessions

Separate groups: All participants Wednesday, 5 October 2011, 11:48 AM --> Wednesday, 5 October 2011, 11:49 AM

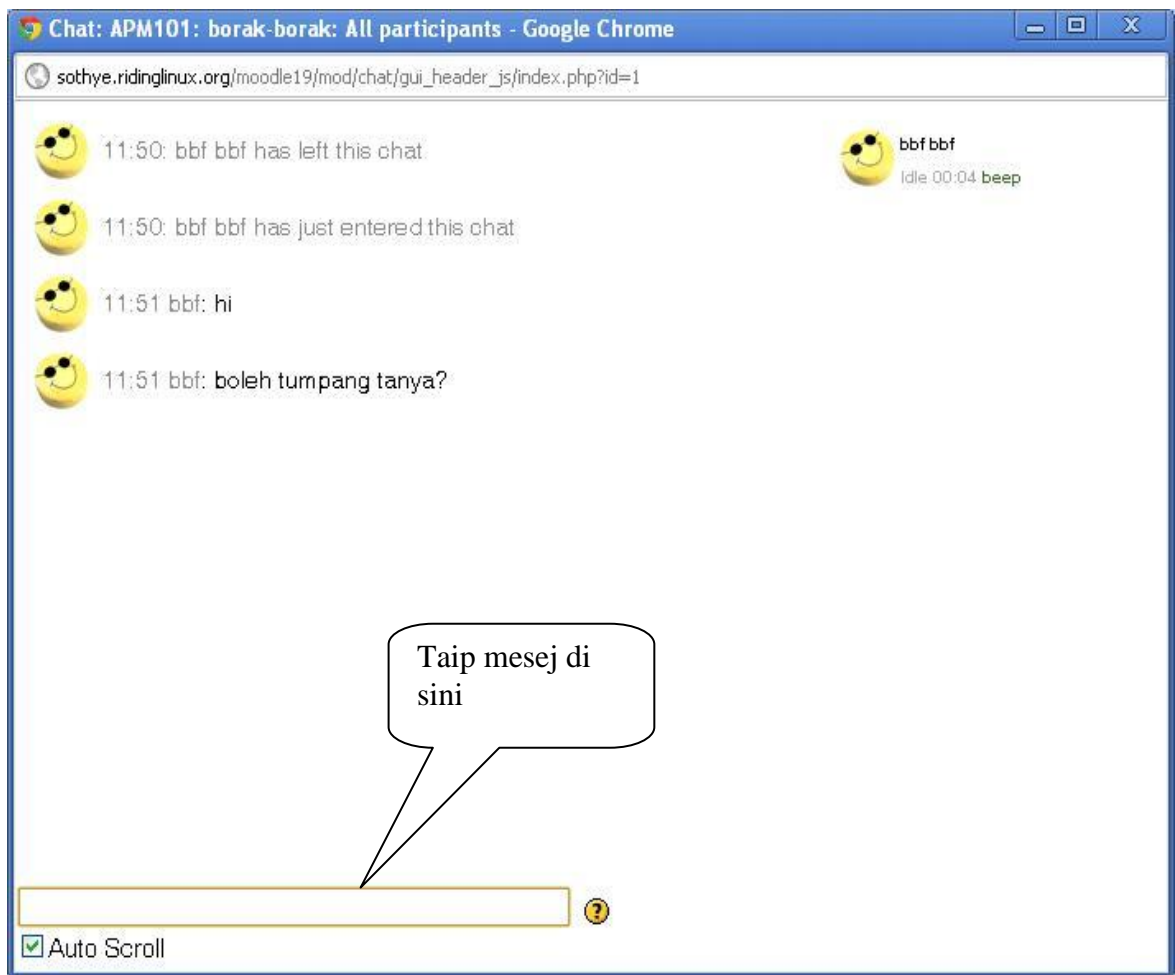
-  11:48: zaidah zul has left this chat
-  11:49: bbf bbf has just entered this chat
-  11:49 bbf: salam
-  11:49 bbf: hi
-  11:49: bbf bbf has just beeped you!

[Continue](#)

You are logged in as bbf bbf ([Logout](#))

Moodle Theme by [NewSchool Learning](#)

Rajah 16: Paparan semasa chatting sedang dilakukan



Rajah 17: Paparan semasa chatting berkumpulan

Modul glosari

15. Glosari adalah rujukan pelajar bagi membantu pelajar dalam melakukan tugas.

16. Ia merupakan senarai perkataan melayu klasik beserta nama yang ditambah dan dikemaskini oleh pensyarah dari semasa ke semasa



Rajah 18: Paparan perkataan dalam glosari

Modul submission & grading

17. Setelah tugas selesai dibuat, ketua kumpulan bertanggungjawab menghantar tugas yang telah disiapkan sama ada secara terus (dari text editor) atau dari local file yang telah disimpan.

The screenshot shows a web interface for team submission. At the top, it says "Hang Jebat Membership is open". Below this, there's a "Submission draft" section with a file named "Team_Assignment_user_guide.doc" and a close button. To the right of this section are buttons for "Delete Team" and "Open/Close". Below the draft section is a "Team Members" list with two members: "ali abu" and "bbf bbf". There's a "Remove Team Member" button below the list. To the right of the team members is a "Team Submission (Max size: 10MB)" section with a "Choose File" button, a "No file chosen" status, and an "Upload this file" button. A speech bubble points to the "Upload this file" button with the text: "Pilih fail dari local driver dan klik 'upload this file' untuk menghantar tugas kepada pensyarah". At the bottom of the interface, there's a "Final submission for assignment marking" section with a "Send for marking" button.

Rajah 19: paparan di mana ketua kumpulan menghantar tugas kepada pensyarah

18. Setiap pelajar akan mendapat markah secara individu
19. Setiap pelajar boleh melihat laporan markah tugas mereka seperti dalam Rajah 20

Submission feedback

shaharizal othman
Wednesday, 5 October 2011, 11:59 AM

Grade: 88.00 / 100.00

good job!

Hang Jebat Membership is closed

Submission

Team_Assignment_user_guide.doc

Team Members

ali abu
bbf bbf

Delete Team

Open/Close

Feedback dan markah yang diterima dari pensyarah

Rajah 20: Paparan komen dan markah yang diberikan oleh pensyarah

Penghantar Filologi : View: User report

Malay ManusKrip > APM101 > Grades > View > User report

Choose an action ...

User report - bbf bbf

Rekod secara individu pencapaian pekajar di dalam kelas

Grade item	Grade	Range	Percentage	Feedback
Penghantar Filologi				
Group Assignment	-	0.00-100.00	-	
Group Assignment	-	0.00-100.00	-	
Latihan	-	0.00-100.00	-	
offline	-	0.00-100.00	-	
Tugasan Group 1	-	0.00-100.00	-	
Team assignment baru	-	0.00-100.00	-	
Kuiz Bulanan	-	0.00-10.00	-	
assignment1	-	0.00-100.00	-	
Tugasan Group 2	-	0.00-100.00	-	
Assignment 1	-	0.00-100.00	-	
Kerja Kumpulan 3	-	0.00-100.00	-	
Kerja Kumpulan 4	88.00	0.00-100.00	88.00 %	good job!
Course total	88.00	0.00-100.00	88.00 %	

You are logged in as bbf bbf (Logout)

Moodle Theme by NewSchool Learning

Rajah 21: Paparan laporan markah pelajar secara individu

APPENDIX G

FOCUS GROUP PROTOCOL –USABILITY TESTING

Date:

Time:

Participants: Lecturers/Students/Researchers

Introduction

I really appreciate you are taking your time to meet me today. I'm hoping we can take another hour together to do the discussion based on the usability testing that u have done just now. To start this focus group session, it seems like it might be helpful if u can introduce yourself by sharing your study and family background.

- a) Researcher briefly introduces herself.
- b) Participants introduce themselves.
- c) Researcher explains why talking with them today
- d) Researcher asks for any clarification questions

Below are the questions that will be asked/discussed during the focus group discussions. They are divided according to the categories as stated:

Usability Dimension	
Effectiveness	The completeness and accuracy with which users achieve their goals
Efficiency	How quickly and directly users can complete their goals
Engagement	The degree of system interface is pleasant, satisfying and enticing to use
Error tolerance	How well the Workspace design could prevent errors, or provide helps for recovery by providing information, selections of actions to correct the problem, or other solutions

Ease of Learning	How well the workspace supports both initial use and extension for deeper understanding
------------------	---

Effectiveness;

1. What ____ (discipline, such as management) skills are important to you? Has this system helped with them?
2. How do the evaluation methods used in the system allow you to demonstrate your level of mastery of the particular manuscript and concepts? Please explain.
3. What one new skill is the most valuable to you? Skills could include ____ (e.g., computer system handling, teamwork, problem-solving, communication, etc.)
4. What is the most significant thing you've learned from this system?

Efficiency;

1. Did you understand the process of doing the assignment in this system? Was it fair? Did it motivate you? How would you change it? Please provide some examples.
2. How do the teaching methods used in the system help you learn?
3. Please share some features in the other e-learning systems do that enhance or detract from either your learning or your enjoyment.
4. What is the estimate of the outside-of-class hours spent on this system?

Engagement;

1. Please offer feedback on the learning options?
2. Please comment on the Malay manuscripts provided.
3. Do you feel that this system interface can attract you to use this system again in the future?

4. Are there things not currently in the system that should be included? Please elaborate.
5. What other activities/modules would you recommend?

Error tolerance;

1. What troubles you most about this system?
2. What do you do when you are having problem when using this system?
3. Is the help menu in the navigation bar helps you?

Ease of Learning.

1. What were your expectations from this system? Were they met? Why or why not?
2. Are there things presently covered in the system that should be omitted? Please elaborate.
3. How does this system give you a better appreciation of the field of Malay manuscripts? Please explain.
4. What changes in the evaluation methods would you recommend? Please explain.
5. Is there anything else you would like to say about this system?
6. What skills have you obtained through the tasks given?
7. What skills do you feel weak in?
8. Which module in the system did you like best? Why?
9. Which module was the most difficult? Why?
10. Which module was the easiest? Why?
11. What aspects of the system did you find most valuable?
12. What aspects of the system did you find least valuable?
13. Which part of this system helped you learn most? Please provide examples.

14. Are there any other comments you would like to make concerning the modules?

-----On the front of the index card, please write "yes" or "no" as to whether you would recommend this system to others. Below your "yes" or "no" response, please write short reason why you selected your response. -----

(Usual index card activity)

-----On the back of the index card, please write one word or phrase to describe your overall impression of this system. Below the word, write a number from 1-5 (1 = lowest; 5 = highest) to describe your satisfaction with the course. -----

1. How does the entire learning experience of this system compare to other e-learning system
2. Do you feel that learning through this system helped you:
 - Grasp
 - Understand
 - Integrate
 - Explore

The Malay manuscripts? Please provide some specific examples.

3. Please comment on how your assignment was graded. Was i fair? Was it accurate?
4. Finally, are there any other comments, observations, or questions about this system?

Thank you for your time and cooperation. Your thoughtful responses to the discussion will help to gain a picture of the students' conditions and environment that would ensure the reception of an e-workspace for Malay manuscripts community.

APPENDIX H

MALAY MANUSCRIPT E-WORKSPACE SYSTEM DOCUMENTATION

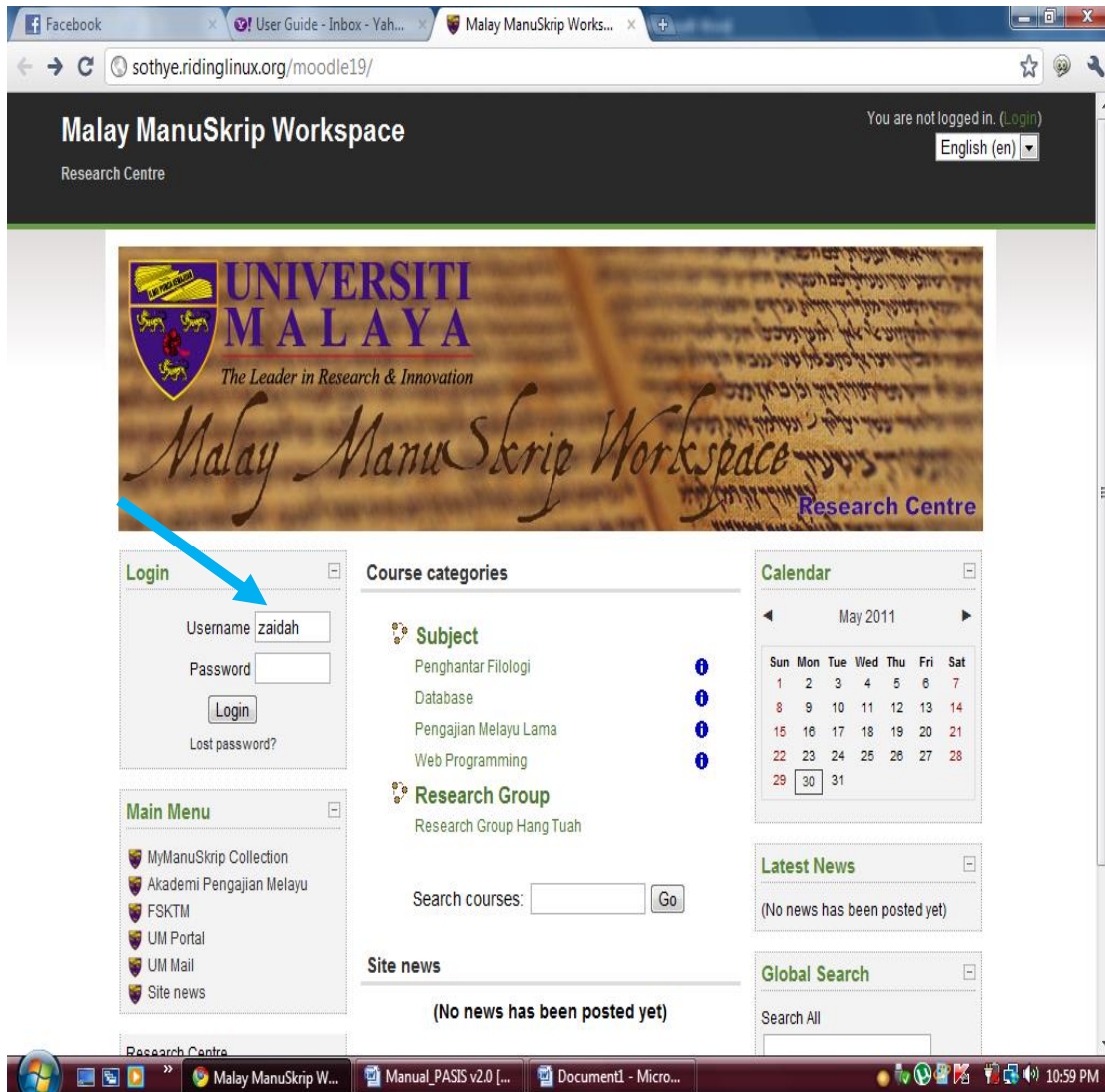
FSKTM, UM

Malay Manuscript E-Workspace

Sistem Dokumentasi

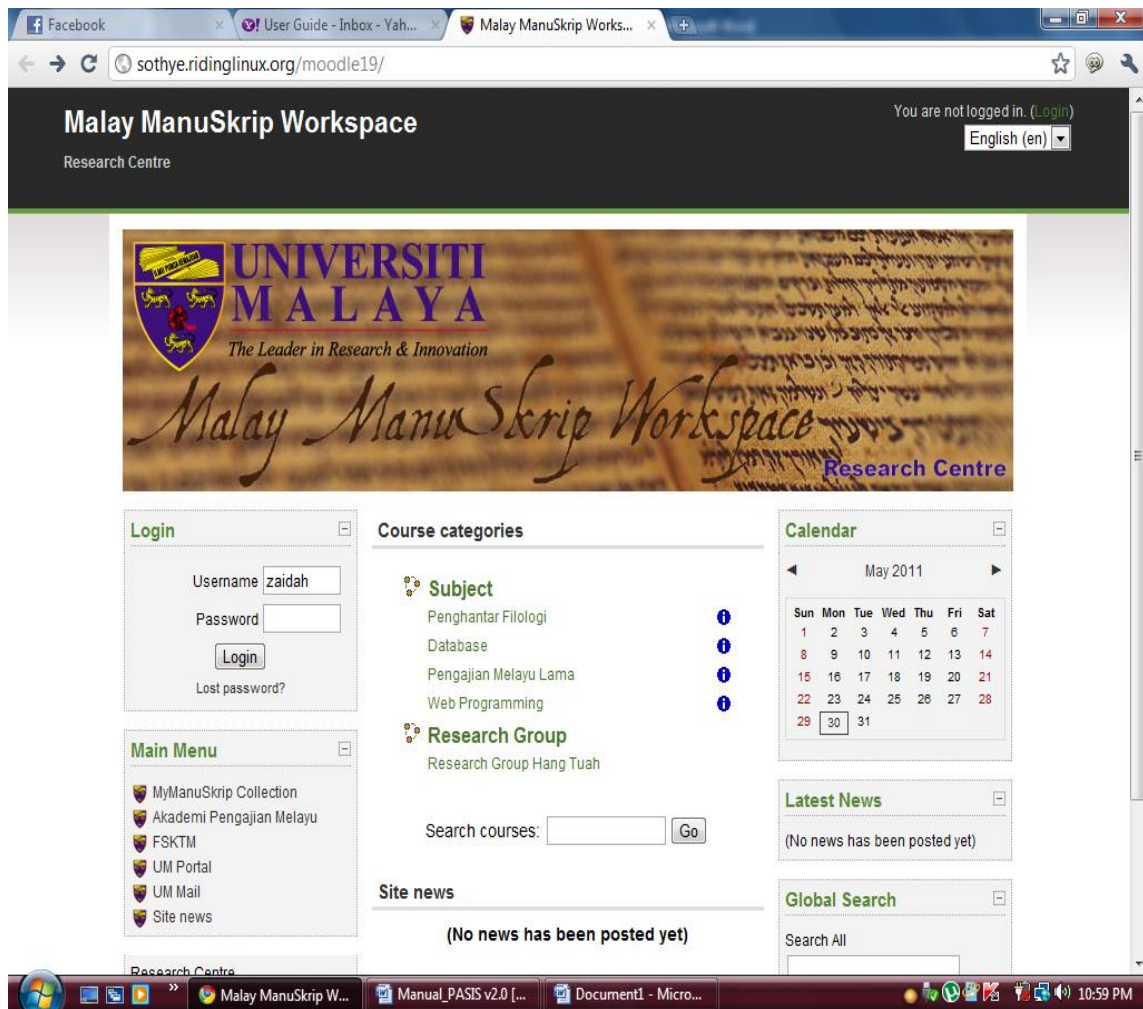
Pengenalan

1. Sila buka pelayar internet anda seperti Internet Explorer, Firefox atau Chrome. Untuk mendapatkan view yang paling sesuai, kami sarankan untuk menggunakan Google Chrome sebagai pelayan internet anda.
2. Taipkan alamat ini : <http://sothye.ridinglinux.org/moodle19/> . Skrin seperti dibawah akan dipaparkan.



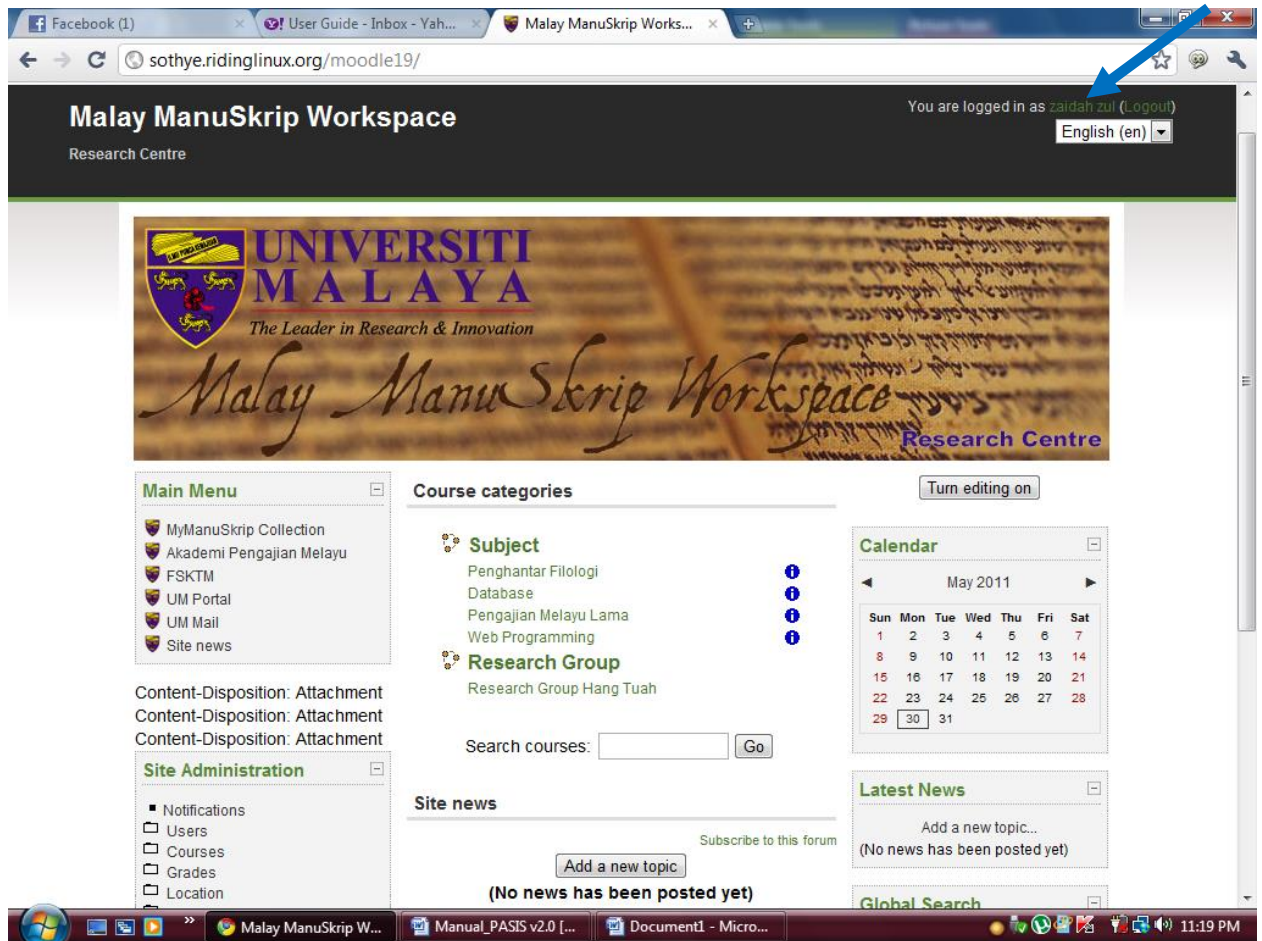
Rajah 1 : Skrin hadapan

3. Pergi ke menu login dan taip kan username = **zaidah** dan password = **Pa\$\$w0rd** (sebagai contoh) seperti paparan di bawah.



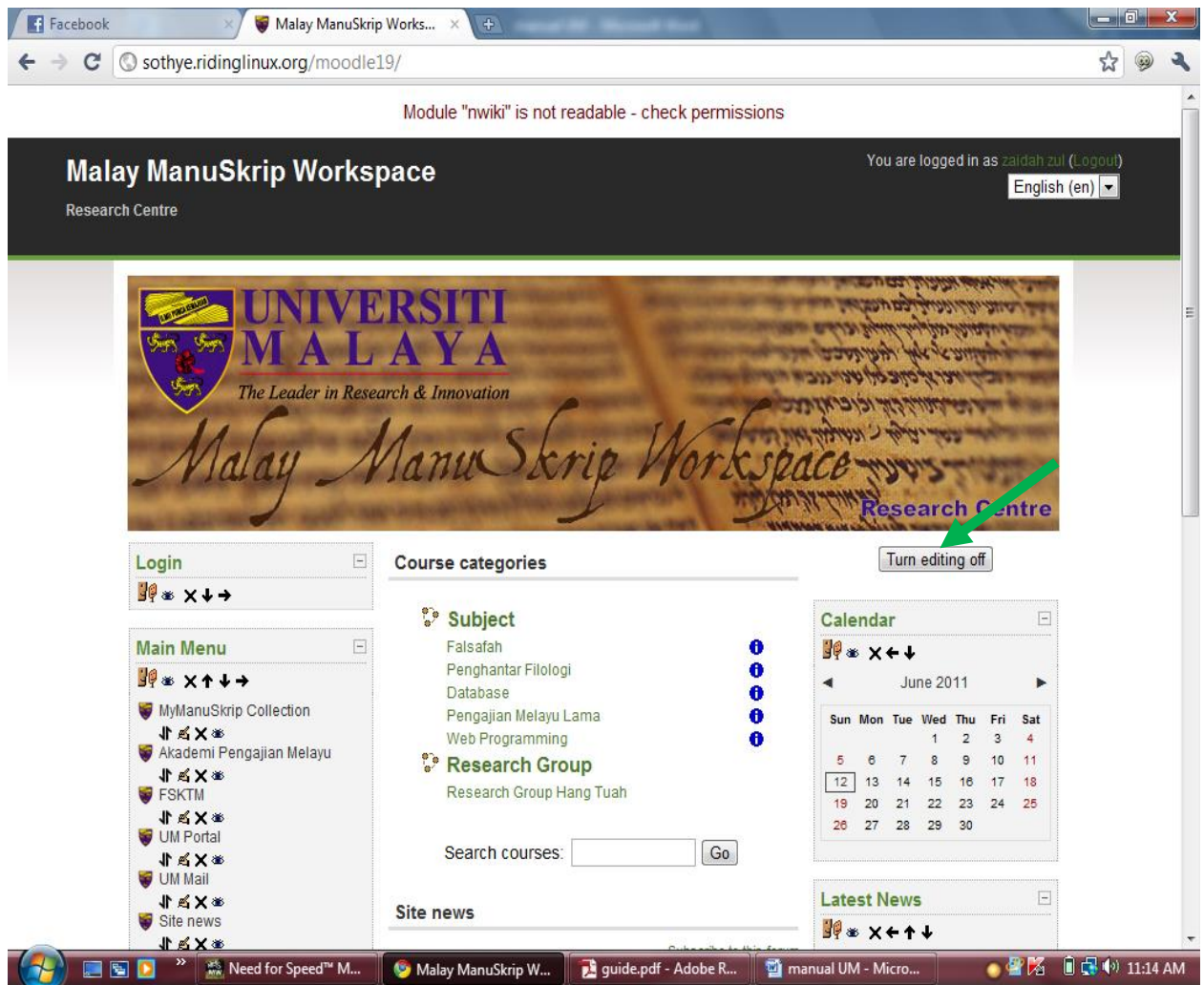
Rajah 2: Log masuk

4. Jika username dan password anda betul, skrin utama akan dipaparkan seperti dibawah.
5. Di paparan utama ini tedapat course categories yang mengandungi peghantar filologi, database, pengajian melayu lama dan web programming.
6. Klik turn editing on.



Rajah 3 : skrin utama

7. Skrin utama akan dipaparkan seperti di bawah.

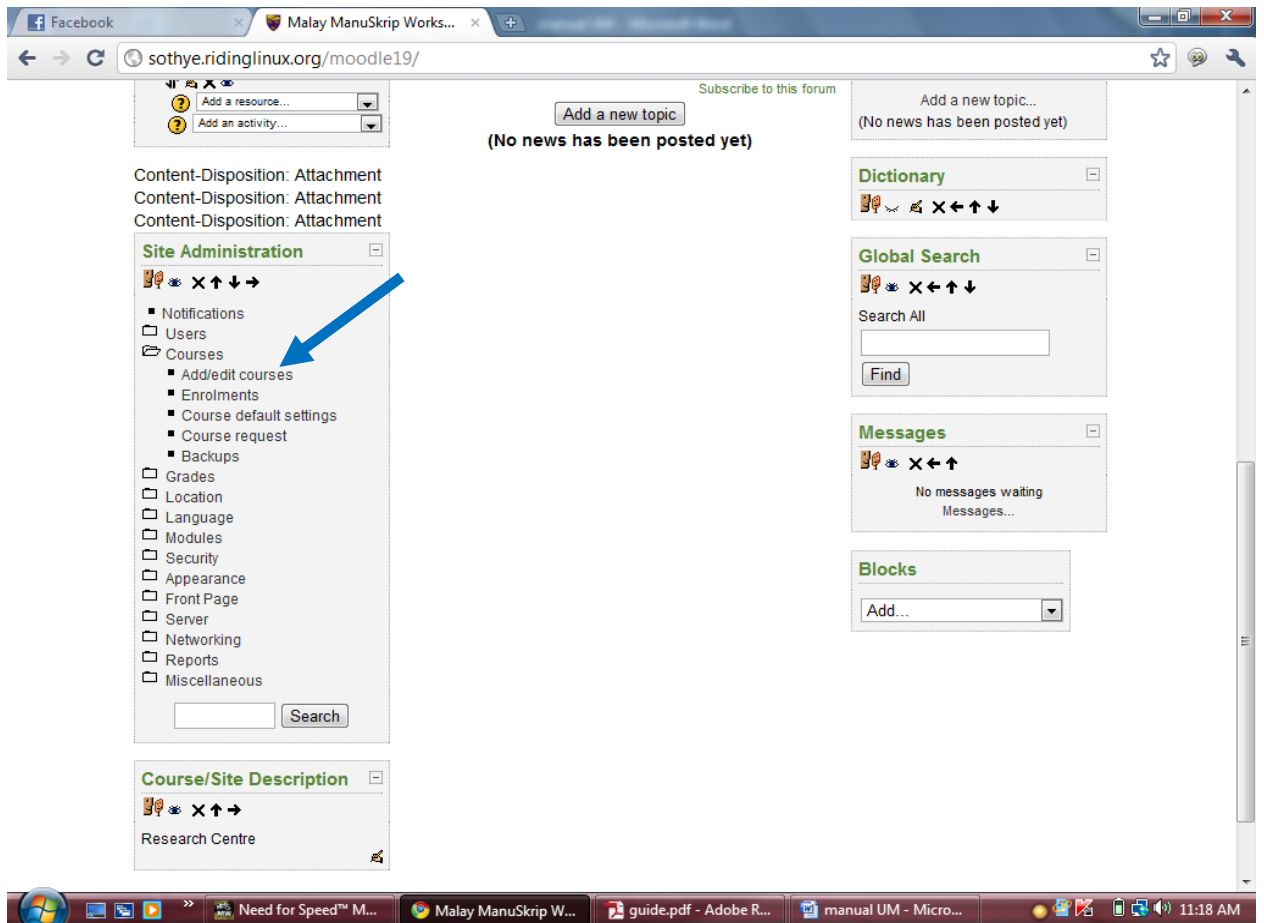


Rajah 4 : Paparan utama editing on

8. Dipaparan yang sama klik kan di bahagian bawah dan anda akan dapat melihat site administration di sebelah kiri anda.
9. Terdapat 13 notifications di site administration ini. Antaranya ialah:
 - a. Users
 - b. Courses
 - c. Grades
 - d. Location
 - e. Language
 - f. Modules
 - g. Security
 - h. Appearance
 - i. Front Page

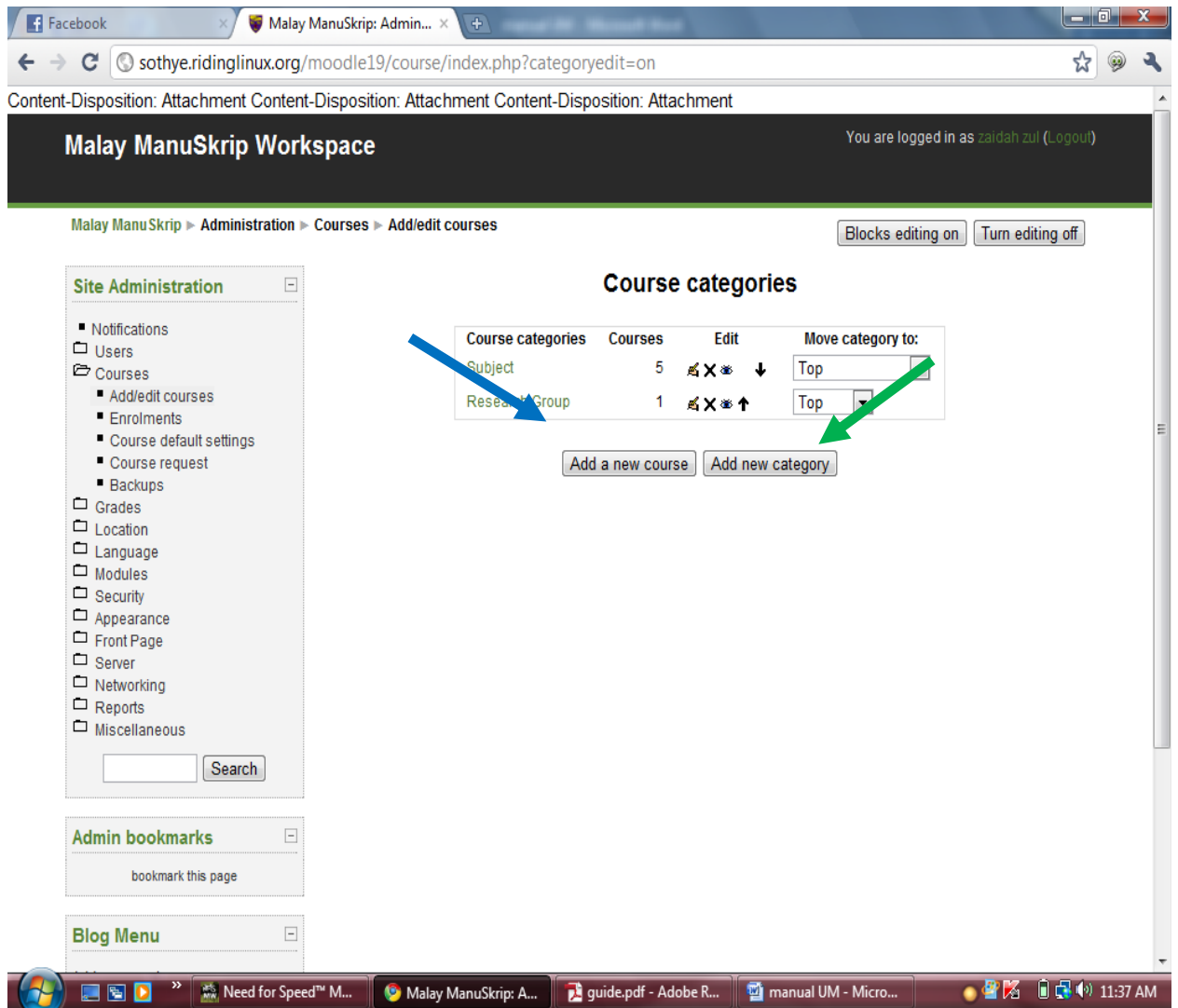
- j. Server
- k. Networking
- l. Reports
- m. Miscellaneous

10. Klik add/edit courses seperti paparan di bawah



Rajah 5 : Skrin utama editing on di bahagian bawah

11. Selepas itu klik add a new course seperti paparan di bawah ini.



Rajah 6 : Skrin utama course categories

12. Masukkan full name, short name,catatn catatan dan pilih format yang anda mahukan di kotak yang kosong seperti di bawah ini.

Facebook Malay ManuScrip: Add a ... sothye.ridinglinux.org/moodle19/course/edit.php?category=1

Malay ManuScrip Workspace You are logged in as zaidah zul (Logout)

Malay ManuScrip Administration Course categories Add a new course

Edit course settings

General

Category ? Subject

Full name* ? Course Fullname 101

Short name* ? CF101

Course ID number ?

Summary ?

Trebuchet 1 (8 pt) Lang B I U S x x

Path:

Format ? Weekly format

Number of weeks/topics 10

Course start date ? 13 June 2011

Rajah 7 : Skrin edit course settings

13. Setelah selesai klik butang save changes.

The screenshot shows a web browser window with the URL `sothye.ridinglinux.org/moodle19/course/edit.php?category=1`. The page displays course settings for editing. The 'Availability' section includes a dropdown for 'This course is available to students', an 'Enrolment key' field, and a 'Guest access' dropdown set to 'Do not allow guests in'. The 'Language' section has a 'Force language' dropdown set to 'Do not force'. The 'Role renaming' section contains a list of roles with corresponding text input fields: Administrator, Course creator, Teacher, Non-editing teacher, Student, Guest, and Authenticated user. A blue arrow points to the 'Administrator' field. Below the roles section are 'Save changes' and 'Cancel' buttons. A red message states: 'There are required fields in this form marked*'. At the bottom, there is a link to 'Moodle Docs for this page', a login status 'You are logged in as zaidah zul (Logout)', and the theme 'Moodle Theme by NewSchool Learning'. The Windows taskbar at the bottom shows several open applications including 'Malay ManuScrip: A...', 'KERJER PAKCU', 'manual UM - Micro...', and 'guide.pdf - Adobe R...'. The system clock shows 4:29 PM.

Rajah 8: Skrin butang save changes

14. Selepas itu paparan seperti di bawah akan keluar.
15. Sila klik butang click here to enter your course.

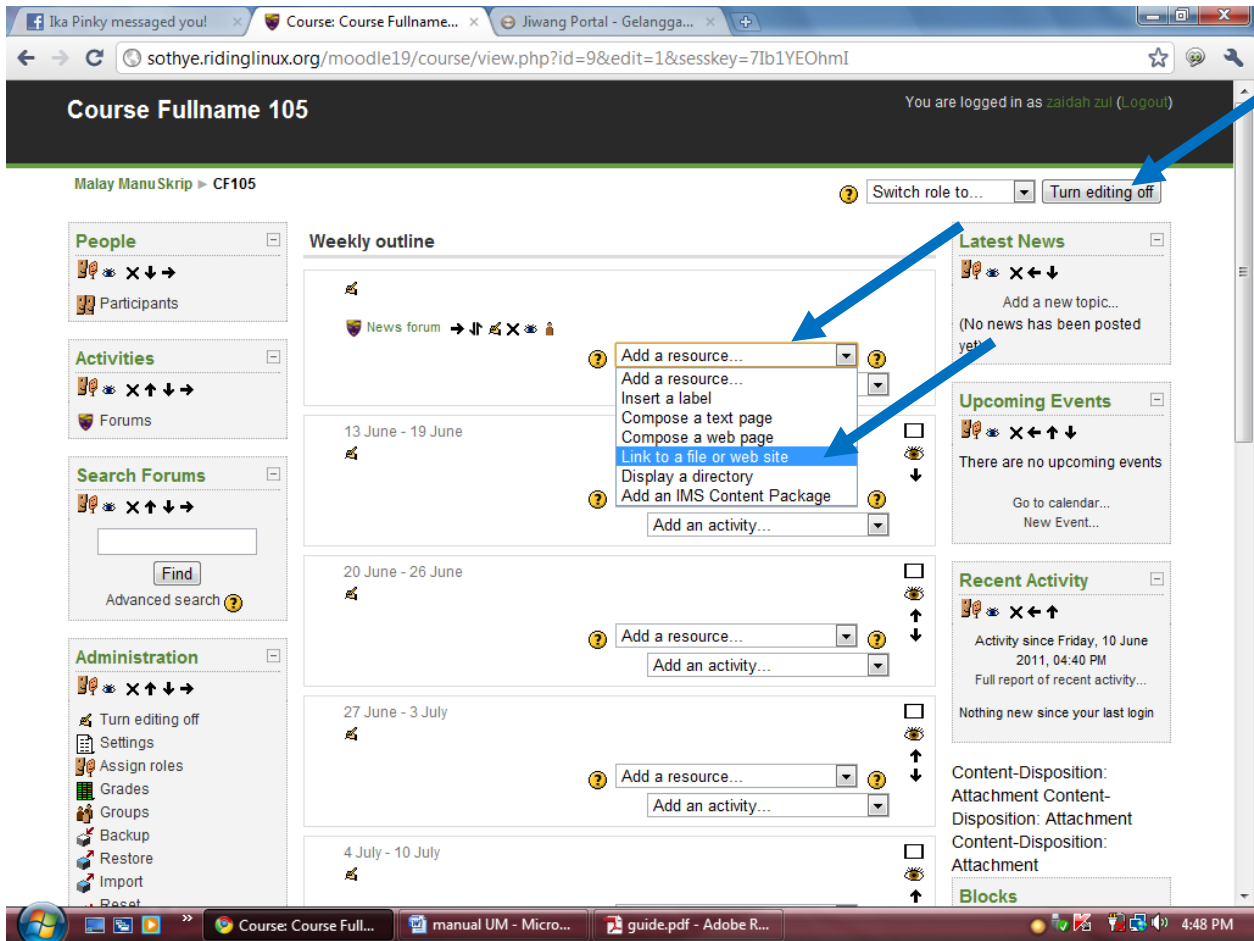
The screenshot shows a web browser window with the URL `sothye.ridinglinux.org/moodle19/admin/roles/assign.php?contextid=161`. The page title is "Course Fullname 105" and it indicates the user is logged in as "zaidah zul". The breadcrumb trail is "Malay ManuScrip > CF105 > Roles". There are two tabs: "Locally assigned roles" (active) and "Override permissions". The main heading is "Assign roles in Course: CF105". Below this is a table with three columns: "Roles", "Description", and "Users".

Roles	Description	Users
Administrator	Administrators can usually do anything on the site, in all courses.	0
Course creator	Course creators can create new courses.	0
Teacher	Teachers can do anything within a course, including changing the activities and grading students.	0
Non-editing teacher	Non-editing teachers can teach in courses and grade students, but may not alter activities.	0
Student	Students generally have fewer privileges within a course.	0
Guest	Guests have minimal privileges and usually can not enter text anywhere.	0

Below the table is a button labeled "Click here to enter your course", which is pointed to by a blue arrow. At the bottom of the page, there is a link to "Moodle Docs for this page", the login status "You are logged in as zaidah zul (Logout)", and the theme "Moodle Theme by NewSchool Learning". The Windows taskbar at the bottom shows several open applications: "Edit course settings ...", "KERJER PAKCU", "manual UM - Micro...", and "guide.pdf - Adobe R...", along with the system clock showing 4:35 PM.

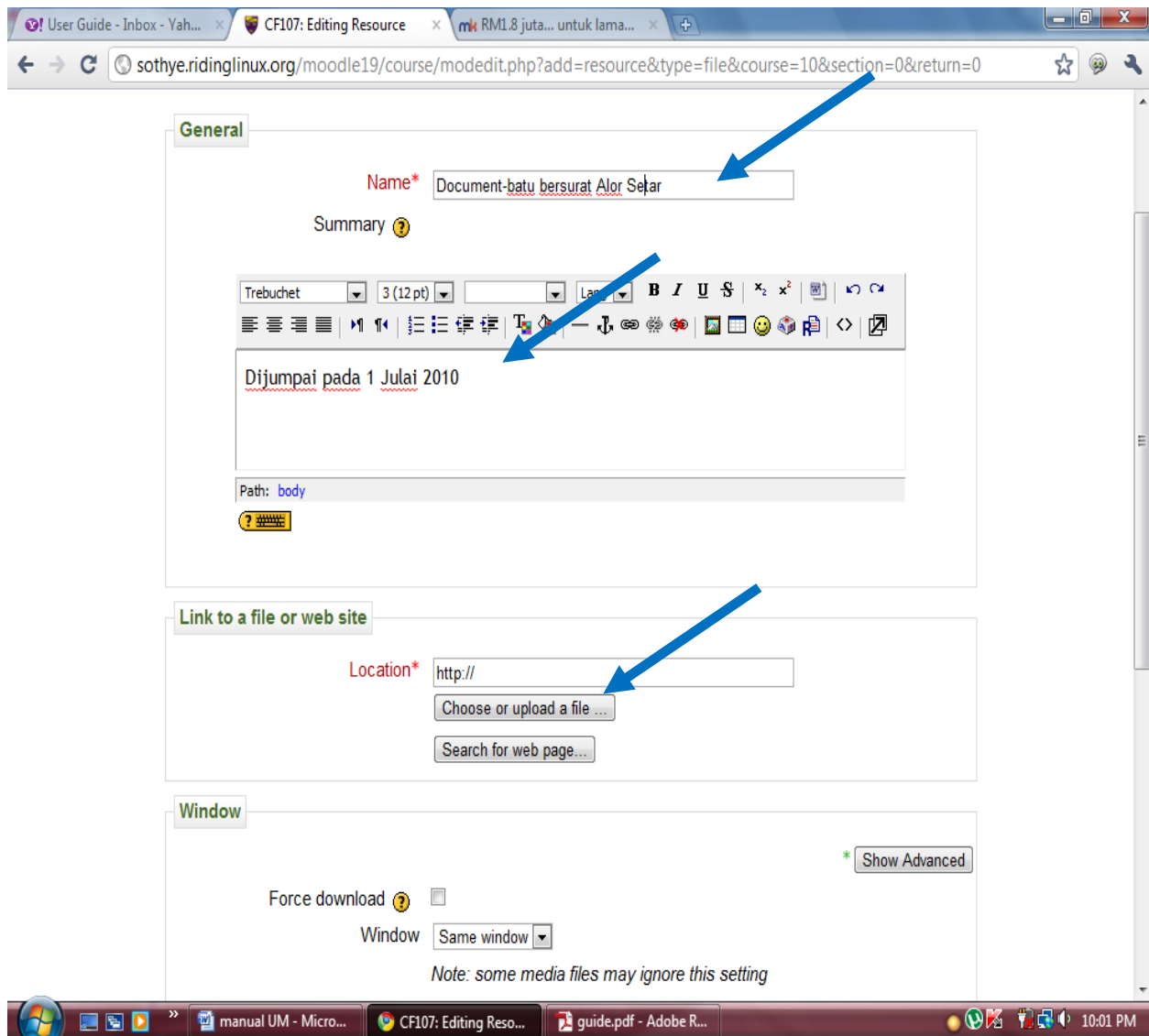
Rajah 9: Skrin sebelum masuk halaman course

16. Klik turn editing on seperti paparan di bawah.
17. Klik add a resource dan pilih link to a title or web site.



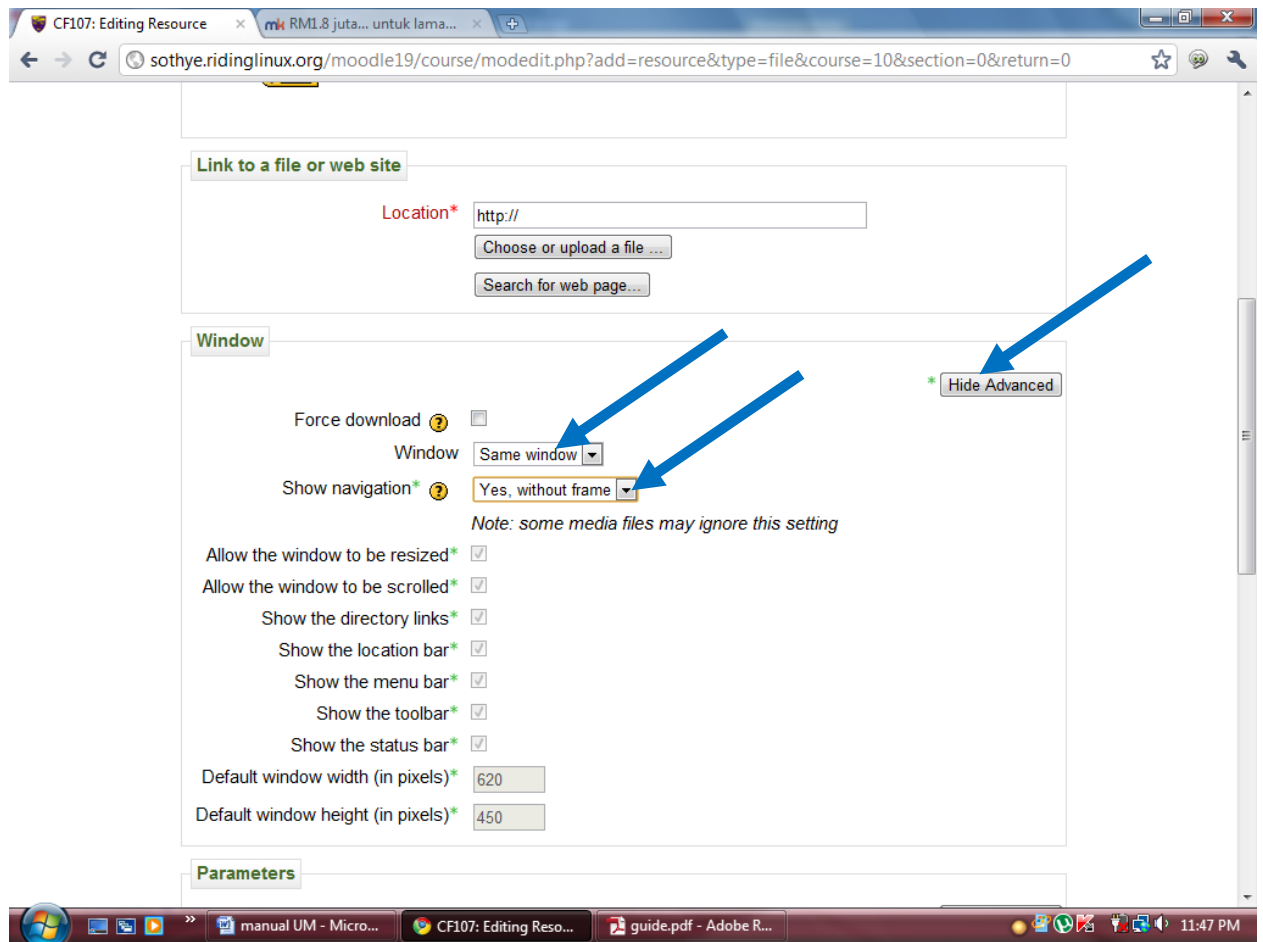
Rajah 10: Skrin halaman course

18. Berikan nama yang berkaitan dengan dokumen dan huraikan maklumat dokumen tersebut di kotak yang disediakan seperti paparan di bawah ini.
19. Ini adalah bertujuan untuk memudahkan pencarian maklumat yang berkenaan.
20. Klik butang upload a file untuk muat naik dokumen yang anda mahukan.



Rajah 11: Skrin untuk muat naik dokumen

21. Selepas klik upload a file, kemudian pergi ke window advanced dan tukar system dokuman seperti paparan di bawah ini.



Rajah 12: Skrin window advanced

22. Klik save and return to course seperti paparan di bawah.

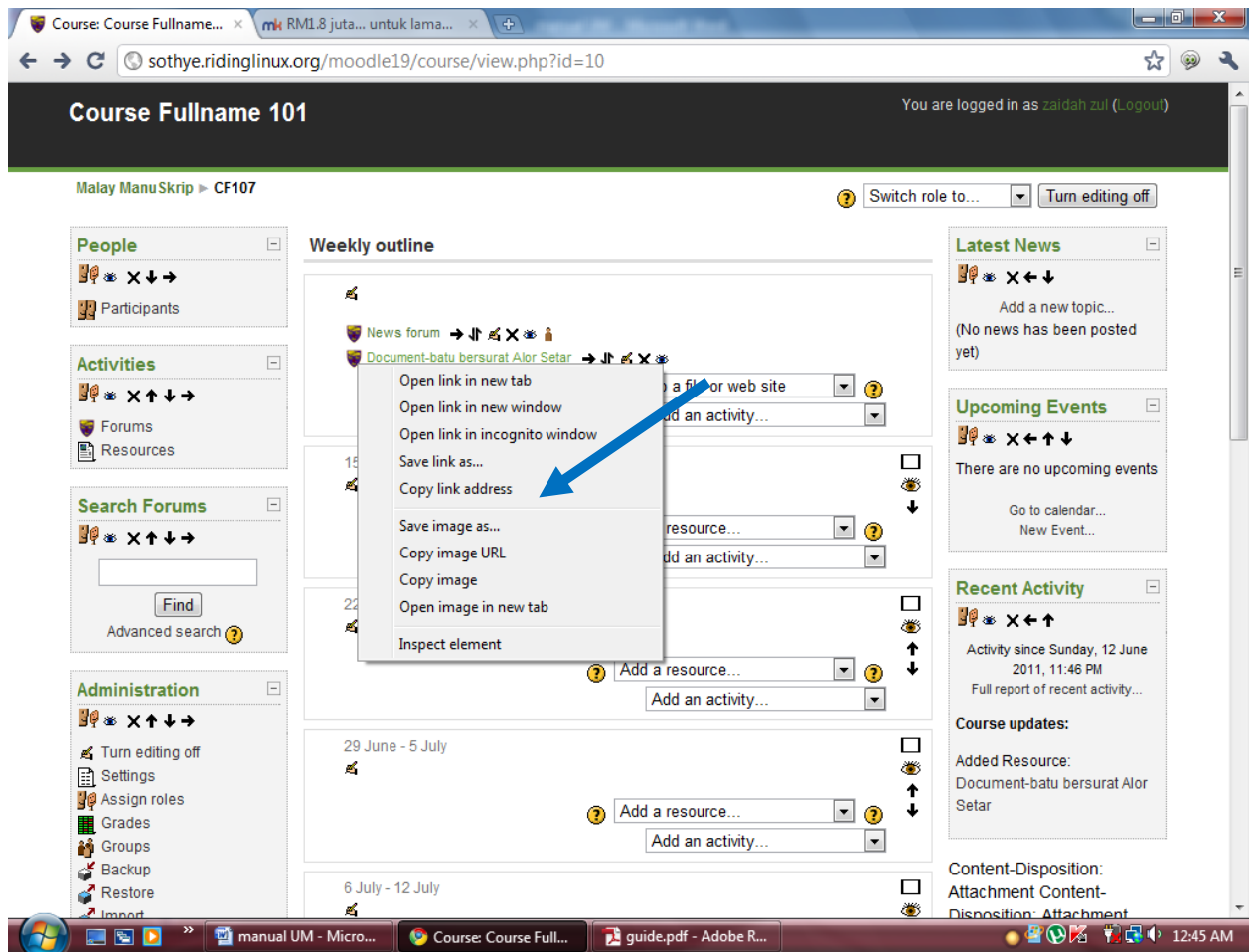
The screenshot shows a web browser window with the URL `sothye.ridinglinux.org/moodle19/course/modedit.php?add=resource&type=file&course=10§ion=0&return=0`. The page displays two sections of settings:

- Variable name=Parameter***: Five identical rows, each with a text input field and a dropdown menu labeled "Choose parameter...".
- Common module settings**: A section with the following options:
 - Grouping***: A dropdown menu set to "None".
 - Available for group members only**: A checkbox that is unchecked.
 - Visible**: A dropdown menu set to "Show".
 - ID number**: A text input field.

At the bottom of the form, there are three buttons: "Save and return to course", "Save and display", and "Cancel". A blue arrow points to the "Save and return to course" button. Below the buttons, a red message states: "There are required fields in this form marked*."

Rajah 13: Skrin menyimpan data

23. Klik kekunci mouse kanan dan pilih copy link address.



Rajah 14 : Skrin copy link address

24. Lagi sekali sila klik link to a title or web site seperti rajah 10.
25. Kemudian anda akan menjumpai paparan seperti di bawah ini.
26. Masukkan name dan penerangan di kotak yang di sediakan dan tampalkan web link yang telah ditirukan atau di copykan sebelum ini di bahagian location.
27. Lakukan juga seperti rajah 12 untuk melengkapkan ubahsuaian ini sebelum menyimpannya.

CF107: Editing Resource

sothye.ridinglinux.org/moodle19/course/modedit.php?add=resource&type=file&course=10§ion=0&return=0

Course Fullname 101

You are logged in as zaidah zul (Logout)

Malay ManuScrip > CF107 > Resources > Editing Resource

Adding a new Resource ?

General

Name* Web Link - Batu Bersurat Alor Setar

Summary ?

Trebuchet 3 (12 pt) Lang B I U S x x |

Web Link

Path: body

Link to a file or web site

Location* http://http://sothye.ridinglinux.org/moodle19/mod/resoui

Choose or upload a file ...

Search for web page...

Rajah 15: Skrin memasukan alamat link

28. Kemudian klik save and display.

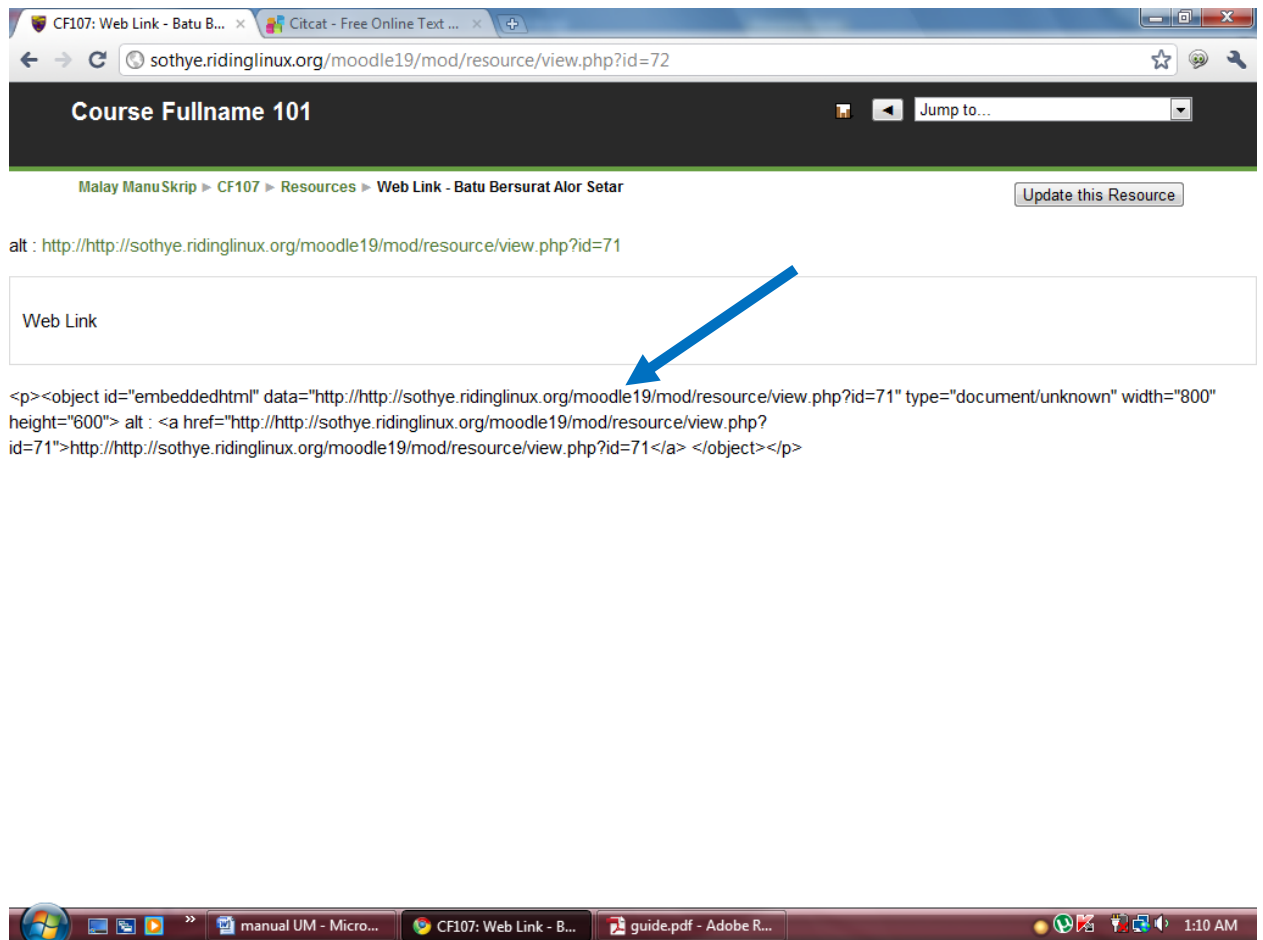
The screenshot shows a web browser window with the URL `sothye.ridinglinux.org/moodle19/course/modedit.php?add=resource&type=file&course=10§ion=0&return=0`. The page displays two main sections for editing a resource:

- Parameters**: Contains five rows, each with a text input field labeled "Variable name=Parameter*" and a dropdown menu labeled "Choose parameter...". A "Hide Advanced" button is in the top right.
- Common module settings**: Contains a "Grouping*" dropdown set to "None", a checkbox for "Available for group members only", a "Visible" dropdown set to "Show", and an "ID number" input field. A "Hide Advanced" button is in the top right.

At the bottom of the form are three buttons: "Save and return to course", "Save and display", and "Cancel". A blue arrow points to the "Save and display" button. Below the buttons, a red message states: "There are required fields in this form marked*."

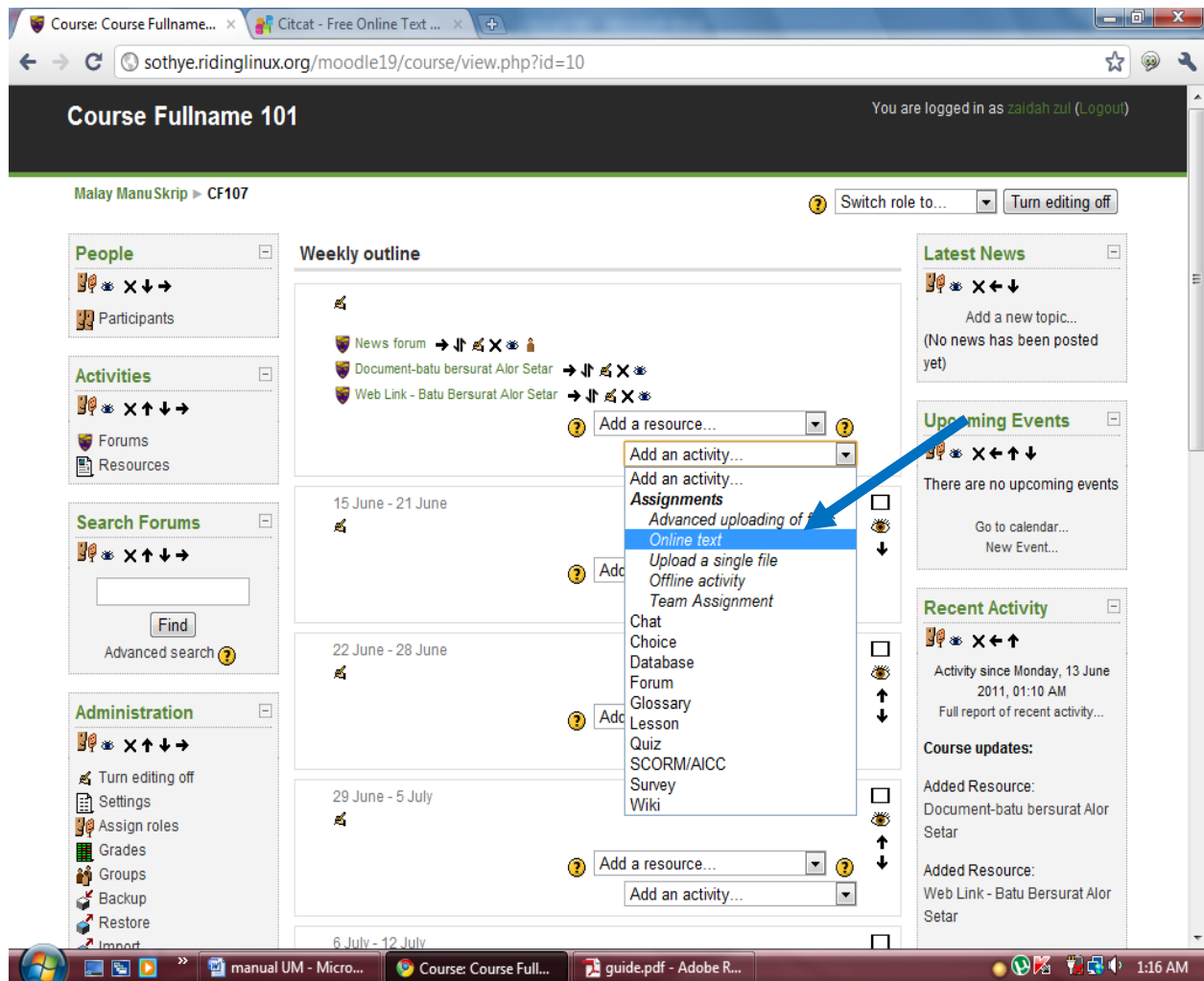
Rajah 16: Skrin save and display

29. Dipaparan ini anda kan melihat suatu html seperti papran di bawah dan anda dikehendaki untuk menyalin semua html tersebut.



Rajah 17 :Skrin html

30. Berbalik ke halaman course, sila klik add an activity dan pilih online text seperti paparan di bawah ini.



Rajah 18: Skrin utama course

-
- CF107: Editing Assignment x Citat - Free Online Text ... x
- sothye.ridinglinux.org/moodle19/course/modedit.php?add=assignment&type=online&course=10§ion=0&return=0
- Malay ManuScrip > CF107 > Assignments > Editing Assignment
- ## Adding a new Assignment ?
- General**
- Assignment name* Transcription - Batu Bersurat Alor Setar
- Description* ?
- Trebuchet 3 (12 pt) Lang B I U S x x
- type="document/unknown" width="800" height="600"> alt : http://http://sothye.ridinglinux.org/moodle19/mod/resource/view.php?id=71</object></p>
- Path: body
- Grade ? 100
- Available from 15 June 2011 01 15 ☒ Disable
- Due date 22 June 2011 01 15 ☒ Disable
- Prevent late submissions No
- Online text**
- Allow resubmitting ? No
- Email alerts to teachers ? No

316

33. Setelah lengkap mengisinya, sila klik save and display.

CF107: Editing Assignment

sothye.ridinglinux.org/moodle19/course/modedit.php?add=assignment&type=online&course=10§ion=0&return=0

</object></p>

Path: body

Grade 100

Available from 15 June 2011 01:15 ☒ Disable

Due date 22 June 2011 01:15 ☒ Disable

Prevent late submissions No

Online text

Allow resubmitting No

Email alerts to teachers No

Comment inline No

Common module settings

Group mode No groups

Visible Show

ID number

Grade category Uncategorized

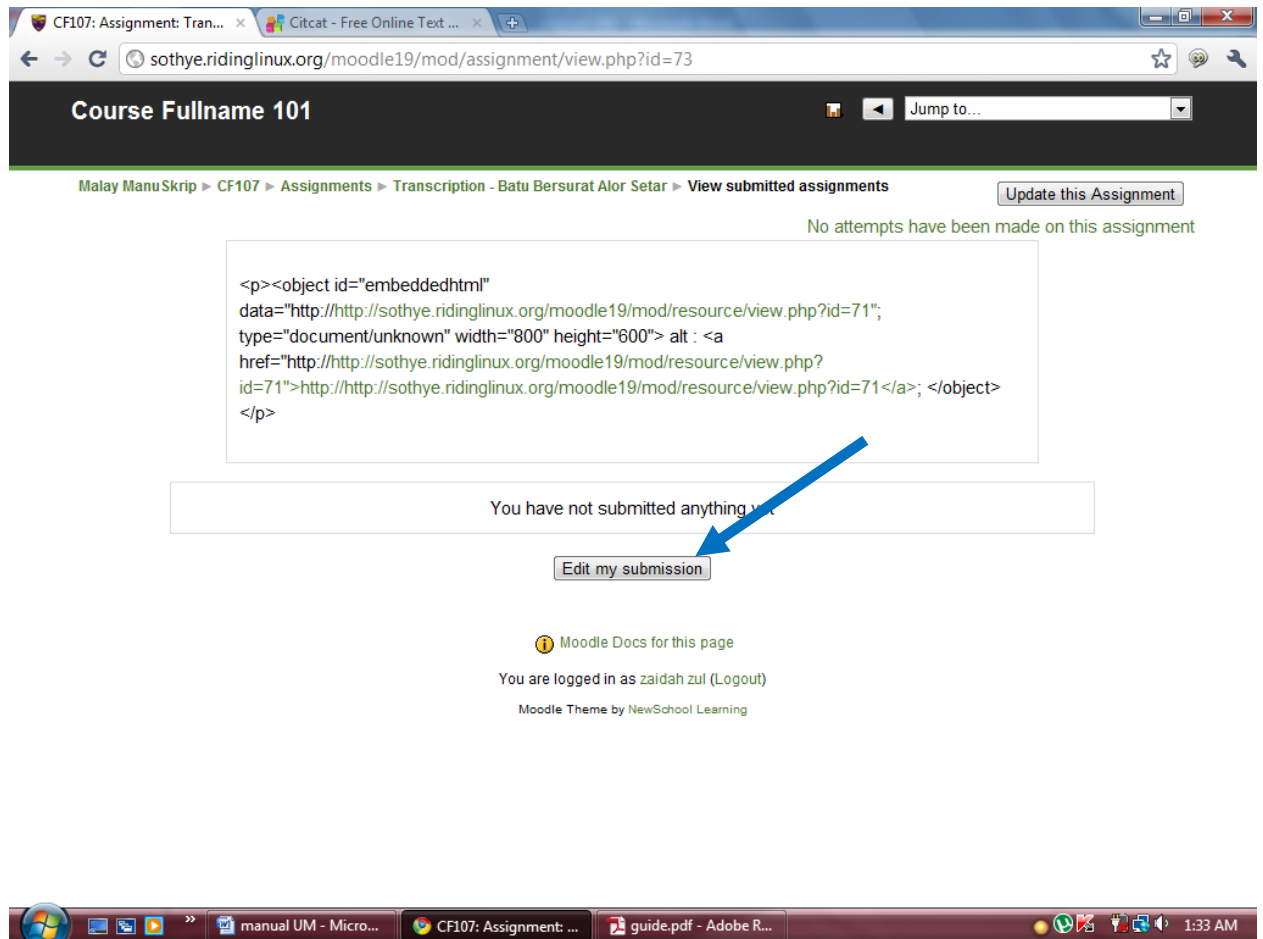
* Show Advanced

Save and return to course Save and display Cancel

There are required fields in this form marked*.

Rajah 20: Skrin akhir sebelum save and display

34. Sila klik butang edit my submission untuk menambahkan salinan yang berkenaan sebelum menghantarnya.



Rajah 21: Skrin terakhir untuk edit my submission

PUBLICATIONS FROM THE STUDY

Journal

Z. Zahidah, A. Noorhidawati and A.N. Zainab. Exploring the Needs of Malay Manuscript Studies Community for an E-Learning Platform. *Malaysian Journal of Library & Information Science*, Vol. 16, no. 3, December 2011: 31-47.

Philology studies are often associated with traditional methods of teaching and learning. This study explores the possibility of e-learning adoption amongst Malay manuscripts learning community. The Soft System Methodology (SSM) is used to guide the investigation. SSM emphasises on understanding the problem situations faced by Malay manuscript learning community and expresses the situations in rich pictures. The manuscript learning community comprises lecturers, students and researchers in the field of philology. Data were gathered from interviews, focus group discussions and observations. Academy of Malay Studies, University of Malaya is the case study setting, focusing on lecturers who teach and students who enrol in a philology course as well as doctoral students researching on manuscript studies. The findings highlight problems faced by the various stakeholders and propose solutions in the form of a conceptual model for a collaborative electronic platform to improve teaching and learning as well as utilizing digitized manuscript surrogates held in a digital library of Malay manuscripts.

Conference Proceedings

Z. Zahidah and A. Noorhidawati. Exploring the Processes and Problems in Teaching, Learning and Researching Malay Manuscripts. Z. Zahidah and A. Noorhidawati ICOLIS 2010, Kuala Lumpur: LISU, FCSIT, 2010

The paper explores the processes and problems of the Malay manuscripts community which comprises lecturers, students and researchers when teaching, learning and researching on Malay manuscripts. The data was obtained from several interview sessions, focus group discussions and through observations. The case study approach was adopted using lecturers teaching and students enrolled in a philology course and researchers on manuscript studies at the Academy of Malay Studies, University of Malaya. The results indicate that the lecturers mainly uses the "chalk and talk" approach when delivering their course; they refer students to one reference source throughout the course; they indicated that students must be able to read Jawi scripts to follow the course; the main assignment involved transliterating work from old Jawi scripted text into modern romanise Malay; and they would like to have access to more Malay manuscript texts that can be utilised by their students for their assignments. The students confirm that their main assignments involved transliterating work; their main source of reference is their lecturer; they are unaware of the existence of a digital library of Malay manuscripts; and are

acceptable to accessing online manuscript resources and being able to hold online discussions with their lecturers and peers about their assignments. The researchers mainly uses printed text for their research; they use the computers mainly to word-process; and felt that online dictionary on classical Malay would help them in their research. The findings on problems and needs express by all three groups are mapped to a proposed framework of online platform for manuscripts studies which includes teaching, learning and researching, utilizing resources provided by MyManuskrip (Digital Library of Malay Manuscripts).

